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Primary Tumors of Bone

M. C. SOSMAN, 1ST LIEUT., M. C.
AND
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A Report of Cases from the Surgical Service of Walter Reed General Hospital, Washington, D. C.

THE recent publication by Bloodgood of a series of bone tumors came at a time when we had the opportunity of seeing and studying a group of similar cases which appeared at this hospital and at his suggestion we are putting them on record.

Realizing the difficulty in reaching an agreement as to the exact type of tumor or even in determining at times the malignanacy or benignity in a given case, we feel that complete and accurate reports of individual cases can be of inestimable value. Primary tumors of bone frequently do not conform to type and as yet we have no criterion in establishing the diagnosis of malignancy. Therefore, exhaustive study of single cases must be made before sufficient data is accumulated to formulate any rules which will be of adequate value in diagnosis. With a sufficient number of these on hand for study and comparison the percentage of correct diagnoses before reaching the pathologist will be considerably raised. For this reason we are presenting these cases completely and in detail, with the exception of the second case (in which operation was refused). Although the roentgenological appearance is not always pathognomonic, it is conceded to be the most efficient aid to diagnosis, and furnishes the most reliable information prior to operation. Perhaps the most frequent errors in roentgenological interpretation are in reporting syphilitic periostitis as periosteal sarcoma, and a central destructive lesion as osteomyelitis. In this connection it is of interest to record the fact that of these seven cases we are report-

ing, three were carried as osteomyelitis and two of them were curetted.

The number of cases is too small to permit any deductions or didactic statements to be made and the time since operation is too short to report them cured cases. A further report will be made of the end results after a sufficient length of time has passed to justify such a report.

CASE 1—(X-ray No. 13163)

White male; age, 39; major, air service; complaint, lump on finger; (see Figure 1).

Fig. 1.—Case I. Photograph of hand, showing small tumor on middle phalanx, ring finger.

History

Duration of swelling, five months, no pain. No disability. This same finger was infected four years ago (1916), at which time incision and drainage was done, with uneventful healing. Patient cannot accurately locate incision, no scar can be seen. No other history of trauma.

Examination

Tumor is smooth, rounded, firmly fixed to bone, but not to skin. Is tender on firm pressure. Feels quite hard, non-fluctuant. Three Wassermanns were negative. Urine shows faint trace of albumen; later clear. X-ray examination was made one month before admission and the roentgenologist interpreted the condition as a periostitis probably with the history of the previous infection in mind. The finger was re-rayed just before admis-

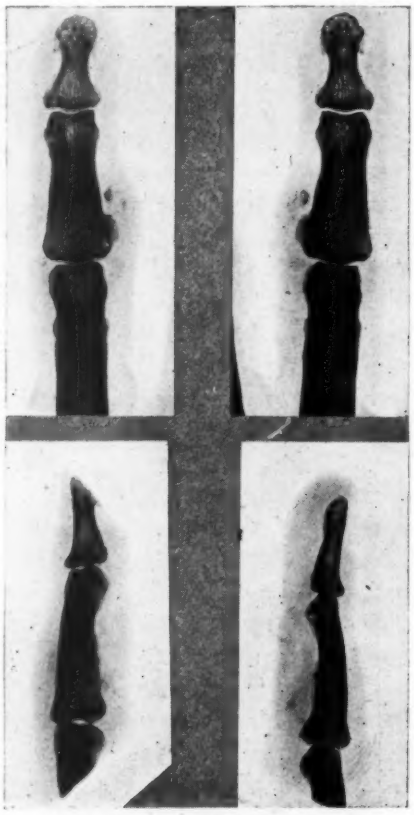

Fig. 2.—Case I. X-ray of finger showing a pedicle of bone (exostosis) with new bone formation in body of tumor.

sion, and as there was thought to be a definite increase in bone

Fig. 3.—Case I. Section through tumor X 10, showing encapsulated cartilage with bone formation.

destruction and production, the diagnosis was changed to sarcoma, the patient being sent to us for amputation of the finger. Our examination (Fig. 2), showed a small bone producing tumor arising from the periosteum of the second phalanx of the ring finger, with questionable destruction of the cortex at its base. Dr. Bloodgood saw the case at this time, with both present and past x-rays and diagnosed it an osteochondroma.

Operation

At operation (Major Parce), the tumor was removed in toto, with a margin of healthy bone; tumor tissue not being seen (Fig. 3). Part of the flexor tendon was in the tumor and was removed with it. The excision of bone was carried into the proxi-

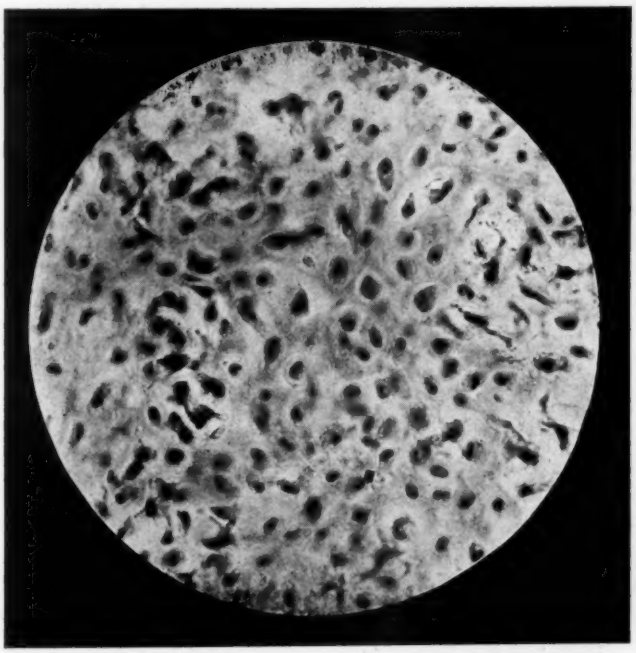

Fig. 4.—Case I. High-power microphotograph showing cartilage cells with loose fibrous tissue.

mal joint. On *microscopical examination* (Fig. 4), Major Schule, Dr. Bloodgood), the diagnosis of osteo-chandroma was confirmed No cellular areas suggesting sarcoma, nor any areas suggesting myxoma. The result has been excellent. Primary union followed, and except for voluntary flexion of the terminal phalanx, patient has full use of his finger.

Discussion

From the x-ray alone the differentiation was difficult. We had a bone producing tumor, periosteal in origin, probably slight cortical destruction at its base, new bone formation perpendicular to the shaft, and a negative syphilitic history and findings. Against this picture of periosteal sarcoma there stood the law of probabilities, as we have not as yet seen or heard of a proven case of periosteal sarcoma of a phalanx. No doubt they can and do occur, but their extreme rarity is a definite aid to diagnosis. As far as the complete removal of the tumor is concerned, Bloodgood has shown that the osteo-chandromata must be treated as potentially malignant, due to the comparative frequency of associated myxoma.

CASE 2—(X-ray No. 11150)

White male; age, 20; soldier; complaint, swelling of wrist.

History

Family and personal history negative. Eight years ago (age 12) this wrist was broken, but it healed normally except for some deformity. Two months ago the radius was refractured during a boxing bout. There was no pain after the third day.

Examination

The interesting part of this case was that an x-ray at that time in a camp hospital was diagnosed as a "fracture with excessive callus." A month later a diagnosis of sarcoma was made at a base hospital and the patient was sent to us for amputation. On being told that the tumor was probably benign, he refused the exploratory operation which

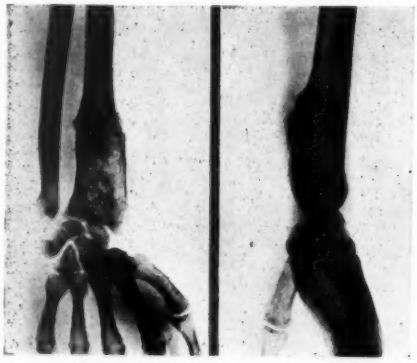

Fig. 5.—Case II. X-ray showing tumor lower end of left radius with pathological fracture through upper portion.

was advised, and as there was no disability or pain, he was discharged shortly afterward to duty.

Discussion

This x-ray (Fig. 5) was interpreted as a healing bone cyst, with an old pathological fracture. There is undoubted evidence of healing, which with the fracture as the first symptom, the

age of the patient, and the duration of symptoms give a fairly typical clinical picture. The location, however, is more suggestive of giant cell tumor, which cannot be ruled out except by an exploratory operation. Of late the tendency has been not to operate on the bone cysts, but to allow them to heal spontaneously while keeping them under observation. But this puts us in a peculiar position, as we cannot be positive that they are bone cysts unless we have a section from the wall for misroscopic examination. For this reason exploratory operation was advised, to rule out giant cell tumor and myxoma, in which case curettement or resection and transplant, respectively, would probably have been done.

CASE 3—(X-ray No. 10501)

Colored male; age, 27; soldier. Complaint, pain and swelling in right knee.

History

Family and personal history negative. Onset sudden with pain in right knee, followed shortly by swelling. No history of trauma. History otherwise negative. This swelling was incised, no pus being found, but the wound did not heal. Three months later the knee was explored for tuberculosis and a piece of tissue was removed which was stained for tuberculosis bacilli with negative findings. While being transferred back to the states, the wound became infected, and on admission he was discharging pus from a small sinus.

Fig. 6.—Case III. X-ray of right knee showing area of destruction in lateral condyle of Femur with perforation of the cortex.

Fig. 7.—Case III. Section through gross specimen showing typical mottled appearance and extension of tumor through soft tissues to skin surface, probably due to previous operation. Note that tumor reaches cartilage but does not invade it.

Examination

X-ray examination at this time resulted in a diagnosis of osteomyelitis. The wound was Dakinized, and it healed slowly from the bottom. Pain and disability remained, and knee was partly ankylosed. Five months later a second x-ray showed, instead of a healing osteomyelitis, a picture of further destruction (see Fig. 6). About the same time a small swelling in the scar was tapped and found to contain blood. Recognizing this then as a tumor, we were at a loss to determine definitely the type, due to the previous operation and the subsequent infection. Dr. Bloodgood's opinion was that the tumor was malignant, and the patient preferred amputation with quick results, rather than a resection with graft and a long hospitalization.

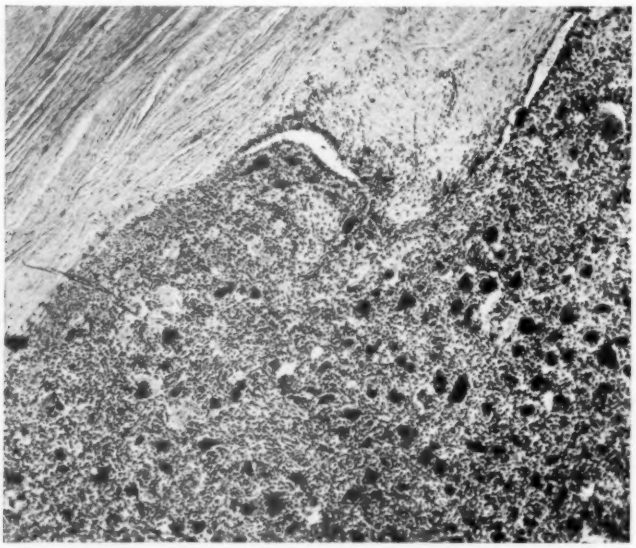

Fig. 8.—Case III. Low-power microphotgraph showing benign giant cell tumor and scar from previous exploratory operation, demonstrating that tumor cells have not infiltrated the scar.

Operation

Operation (Major Kirk). Amputation through thigh at junction of upper and middle thirds of femur. Bone and marrow normal at this point (Fig. 7). Microscopical examination (Bloodgood) showed an encapulated giant cell tumor of epulis type. Does not invade cartilage, nor the scar of operation (Figs 8 and 9). The result was excellent. Operative scar healed in ten days. Three months after operation the patient was discharged with his permanent artificial leg.

Discussion

This case presents a not unusual history of being treated as

osteomyelitis for a number of months. If an exploratory operation had been done and a piece of tissue removed for resection, the character of the tumor would have been recognized immediately. A complete curettement with saving of the leg, but probably ankylosis of the knee, would have followed. This case also illustrates the fact that, from x-ray, perforation of the cortex does not always mean malignancy. This condition has also been noted in bone cysts, pure myxoma and chondroma.

CASE 4—(X-ray No. 13454)

White male; age, 30; medical officer.

History

Complained of pain and disability in right shoulder. Duration of pain, nine years; swelling and disability, five years. This right shoulder in 1909 and 1910.

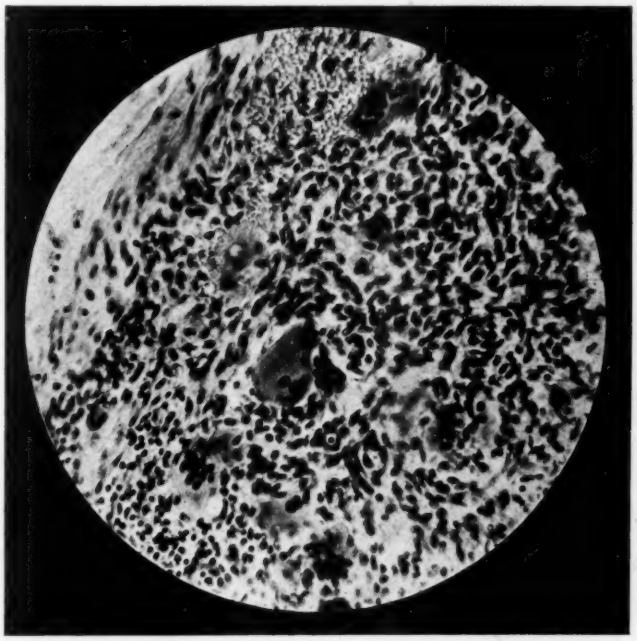

Fig. 9.—Case III. High-power microphotograph showing giant cells of epulis type in typical giant cell tumor tissue.

case has been previously reported rather completely and we show it as a case of unusual interest and for suggestions as to treatment rather than a question of differential diagnosis. A short extract of his history might be of interest. Three dislocations of Pain in shoulder 1911, x-rays said to be negative at that time. In 1912 a severe typhoid, with phlebitis, pulmonary infarcts and thrombosis of both axillary veins. In 1916 the pain recurred with swelling for the first time and marked disability.

Examination

X-ray then showed "bone shell with marked expansion in region of greater tuberosity with markings suggesting a multicystic tumor."

Operation

Operation was done January, 1916, and the greater tuberosity, a piece of the shaft, the bicipital groove and a part of the lesser tuberosity removed. The gross appearance was that of a multicystic tumor containing blood. The pre-operative diagnosis and the diagnosis at operation was probably typhoid osteomyelitis, but the microscopical report was "haemangioma cavernosum." Pain recurred and re-operation was performed three months later for recurrence, but none was found. Specimens removed were reported "inflammatory tissue." The patient was relieved, however, of all symptoms, entered the army and did full duty until April, 1920, when all his symptoms returned following a strenuous game of tennis. At this time Dr. Garre' of Bonn University, Germany, saw the patient, x-rayed his shoulder and diagnosed it sarcoma, advising amputation. Instead of this being done he was returned to New York, where a third operation was done in July, 1920. At this time there was removal of cartilage and a bony spur the size of end of finger near the joint, and some tissue resembling a blood clot imbedded in bone and old scar tissue. The surgeon's opinion was again granulation tissue, but the pathologist reported angio-cavernoma of bone. Ten days later 30 cc. of clear fluid was aspirated from the shoulder joint evidently due to a chronic synovitis. The Wassermann was consistently negative, and the urine has shown nothing abnormal. (We can find no record of a Widal test).

On admission to the hospital he stated that his symptoms had not been abated by the last operation. There was marked pain on motion, causing disability, but no marked point tenderness. All the symptoms could be attributed to the joint. X-ray examination at this time (Fig. 10), without a history of the case, yielded a report of bone destruction and removal, slight bone proliferation,

Fig. 10.—Case IV. X-ray of right shoulder. (See text) For previous x-ray and microphotographs see reference.

periosteal and osteogenetic, with several small sequestra, suggesting a low grade chronic osteomyelitis. Monthly examinations showed no change.

Discussion

Our belief is that this condition is benign. It is most improbable that a sarcoma situated in the center of the humerus of a haemorrhagic cystic type present at least five years and operated on five years ago and twice since then could give the x-ray findings of September, 1920 (Fig. 10). Dr. Bloodgood who saw the x-ray, states that it suggests "a healing process of a central lesion, with periosteal bone formation of the type found in osteoarthritis." Also, at the second operation, some of the inflammatory tissue removed was found to be within a new bone shell. This apparent reformation of a bone shell, is against sarcoma. Whether or not there is any relation of the lesion to the typhoid in 1912 is under discussion. Certainly as far as our studies go, this is a possibility—a typhoid osteomyelitis with a mass of peculiar granulation tissue. As for the treatment, Dr. Hitzrot in a private communication, states "the patient is bound to have some pain, owing to a chronic arthritis and thickening of capsule, as a result of the operation. Use, with baking and massage, is indicated; resection would not help." This opinion as to further treatment was concurred in, and at this hospital physio-therapy was given, but to no avail. The only relief was given by fixation and traction, which, however, left more disability after removal. The final disposition was retirement from the service, as it was evident he could not do full duty.

CASE 5—(X-ray No. 13563)

White male; age, 25; soldier. Complaint, pain, swelling and disability in knee.

History

Family and personal history

Fig. 11.—Case V. X-ray of left knee, lateral view, showing spotty areas of destruction through lower end of left femur.

negative. Indefinite history of trauma. Duration of pain, ten months; swelling and disability, eight months. Gradual increase of all three symptoms, with loss of weight. Aspiration of knee joint, six months before admission, sterile fluid found. The pain was

relieved by support and extension with traction.

Examination

Large, smooth, rounded swelling of left knee, which is fairly firm, not boggy, and rather tender. Knee shows very little if any motion. Marked atrophy of thigh and calf muscles. Inguinal glands not palpable. Patient is poorly nourished and anaemic. Blood Wassermann and urine negative. X-ray examination of chest shows an old fibrosed apical lesion. X-rays of knee (Figs. 11 and 12), show very poor bone detail, due to huge, soft tissue swelling. Multiple small areas of bone destruction with very slight new bone formation. Apparent perforation of the cortex at several points. Articular surface of medial condyle destroyed. This was first reported as tuberculosis, but on consultation the diagnosis was changed to sarcoma.

Fig. 12.—Case V. Antero-posterior view, showing huge soft-tissue tumor almost obliterating bone detail.

Operation

(Major Kirk). Amputation through thigh at the junction of the upper and middle thirds. The bone and marrow at this point were normal (Fig. 13). Microscopical examination (Major Callender), showed a typical small round cell sarcoma, periosteal in type (Figs. 14 and 15). Primary union. The result has been immediate gain in weight of twenty pounds in five weeks and a marked improvement in general health.

Fig. 13.—Case V. Section through gross specimen showing huge periosteal growth with destruction of cortical bone greater than shown in x-ray, involvment of shaft without periosteal bone formation, and little or no fibrous reaction.

Discussion

There is nothing unusual about this case, as bone tumors go. The important point, as far as our examination was concerned, was that, although the articular surface of the femur was destroyed in part, the tibia opposite this showed no involvement, which is strongly against tuberculosis.

CASE 6—(X-ray No. 13247)

White male; age, 43; soldier. Complaint, pain and swelling in right shoulder. Duration of pain, one year, six months. Swelling, one year, three months. Limitation, one year.

History

In March, 1919, patient noticed a small area on the point of the

Fig. 14.—Case V. Low-power microphotograph showing tumor cells invading fat and fibrous tissue. Type of small round cell sarcoma.

right shoulder, which was painful to touch and in which there were occasional aching pains. This was brought to his attention when lying on his right side, and was attributed to the use of a hard mattress. The pain has been more or less continuous since that time, disappearing completely for periods of from two to six days. The severity of the symptoms gradually increased up to the present time. Three months after the pain was noticed a small swelling was found occupying the same area. There has been

no history of trauma preceding the first symptoms. No loss of weight, patient feels well except for the pain, which is worse at night, sometimes requiring the use of opiates. *Past History*: Patient has had an iritis in one eye and a cataract extraction in the other eye. Has had a bilateral inguinal adenectomy. Patient's wife has had one miscarriage, eighteen months after marriage, and has not been pregnant since.

Examination

Eye conditions as noted above. Scars of bilateral inguinal adenectomy. Scar on glands. Shoulder: There is a small swelling over the greater tuberosity of

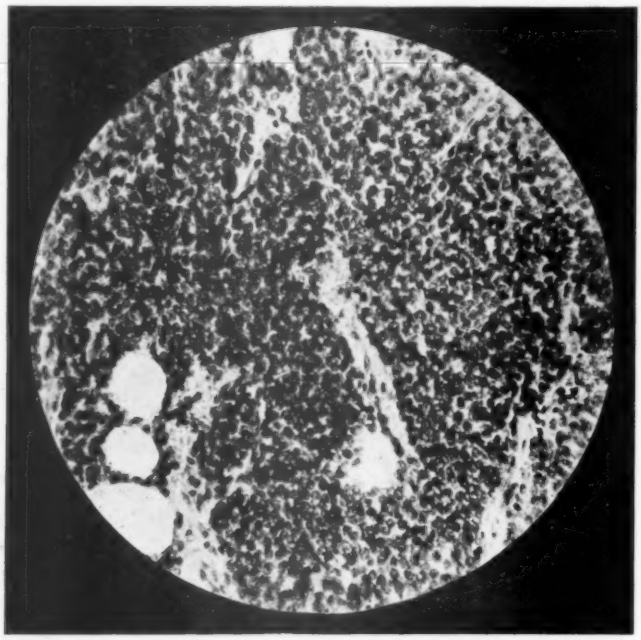

Fig. 15.—Case V. High-power microphotograph. Small round cell sarcoma, cells of nearly uniform type, size, and morphology, resembling Ewing's "endothelial myeloma."

the right humerus, which is tender to pressure. No movable mass can be felt and no involvement of the soft parts or of axillary and cervical glands can be made out. There is definite limitation of the shoulder joint apparently due to the pain and most marked on abduction. *X-ray Examination*: (See Fig. 16). Shows expansion of the upper end of the humerus in the region of the greater tuberosity and apparently extending through the epiphyseal line into the head of the bone. The expansion is rather symmetrical, but the involved area is cloudy and appears lobulated, not smooth, as seen in bone cysts, nor mottled,

as seen in older bone cysts or in giant cell tumors. The cortex appears to be almost destroyed in places and there are fine perpendicular lines of periosteal new bone formation. Laboratory ex-

Fig. 16.—Case VI. X-ray of right shoulder. For description see text.

amination shows a negative urine and a plus minus Wassermann reaction. The x-rays of this case, with an abstract of the clinical history and laboratory findings, were presented to a group of prominent roentgenologists and surgeons with a request for an expression of opinion. The majority favored a low grade inflammatory process. The most plausible was the suggestion that it was due to syphilis, as the patient presented a very suggestive history. Several, among them Dr. Bloodgood, insisted that the condition was malignant, but all agreed that a course of salvarsan should be tried as an aid to diagnosis, as well as for therapeutic purposes. Accordingly, the patient received six doses of salvarsan between September 11 and October 2, without the slightest benefit. In addition, the disease was attacked from another angle and radium was tried. On September 15, five and five-sixths mc. of radium emanation was implanted in a small glass capillary tube, 2mm. long and ½ mm. in diameter into the center of the head of the humerus through a hollow needle. On October 2, 1920, seven and four-fifths mc. radium emanation was implanted in tubes into the head of the humerus. Neither gave any relief from symptoms. A second x-ray, five weeks after the first one showed a slight but definite

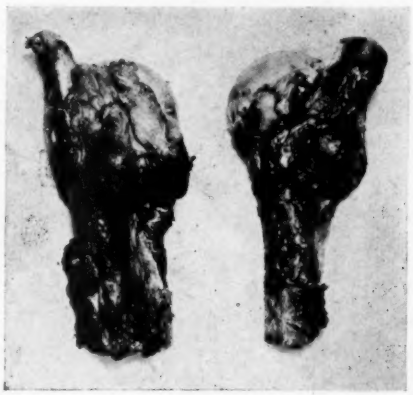

Fig. 17.—Case VI. Photograph of gross specimen, showing at X the area where crepitation could be felt.

increase in the size of the tumor, and the cortical destruction. Operation was performed at once and based on these findings, a

positive diagnosis of sarcoma was made.

Operation

On the morning of the operation, palpation revealed an area of distinct parchment-like crepitation (Fig. 17), near the head of humerus, and for this reason resection was advised without exploratory incision. The operation (Major Kirk) was a disarticulation of the right shoulder, with resection of the humerus at the junction of the upper and middle third. Tumor tissue was not exposed during disarticulation, but when the biceps tendon was dislocated from its groove, clear serum exuded, suggesting perforation of the cortex. The wound was thoroughly sponged with alcohol. When the humerus was resected a small particle of tumor tissue was seen in the marrow cavity, and frozen section showed definite evidence of malignancy. Immediately this was sponged with alcohol and the humerus resected above the condyles. Here the bone and marrow appeared normal. This condition of expansion down the shaft was explained on section of the tumor (Fig. 18), when it was found to be under quite a bit of pressure and the marrow cavity was the point of least resistance. The upper eleven inches of the left fibula was grafted into place (Fig. 19), the lower end being inserted into the marrow cavity and the head of the fibula being placed against the glenoid and sutured. The wound closed without drainage, and although the patient was somewhat shocked, he made an uneventful recovery. The result has been all that could be expected.

Fig. 18.—Case VI. Longitudinal section through gross specimen showing expansion of tumor down shaft, central area of destruction in tumor and perforation of cortex. Tissue in gross was white, opaque and gelatinous, suggesting myxoma.

Fig. 19.—Case VI. X-ray showing fibular graft in position, supported by modified airplane splint.

Seven weeks after operation he was free from all pain, had gained in weight, and had a fair amount of motion in the shoulder. The microscope showed (Figs. 20, 21, 22), a cellular tumor, small round cells and spindle cells with several myxomatous areas and several central areas of degeneration which may have been due to the radium or to the lack of blood supply which frequently causes central degenerative changes, especially in rapidly growing tumors.

Discussion

Our experience in this case illustrated the futility of attempting to make a diagnosis from the x-ray plate alone, even if combined with the ordinary clinical and laboratory findings. The line

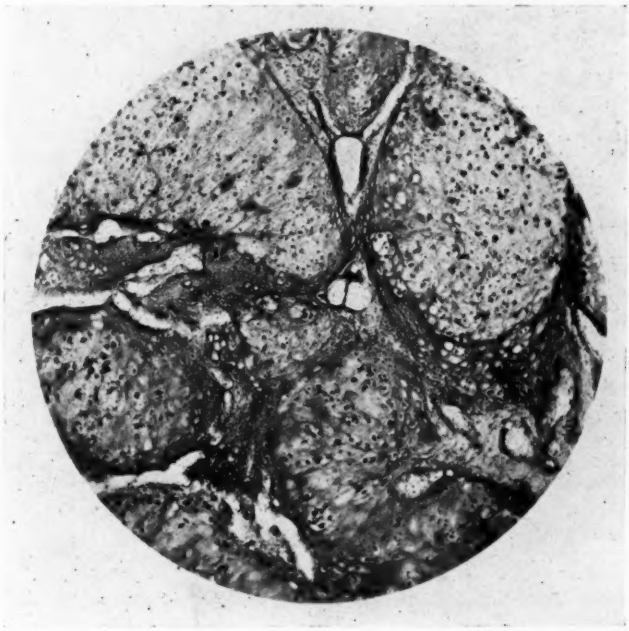

Fig. 20.—Case VI. Low-power microphotograph showing myxomatous and fibrous areas.

of treatment followed in this case is believed to be the most reasonable with our present knowledge, and is based on the fact that the percentage of cures in true sarcoma of bone is quite small, even with amputation. This accounts for the choice of resection and graft rather than amputation, thereby saving the limb and offering as much hope for a cure in the former procedure as in the latter. Unfortunately, tumor tissue was met unexpectedly in the bone marrow, well below the lesion, and although immediate steps were taken to destroy any transplanted

cells, the prognosis as regards recurrence is distinctly less favorable. In regard to the radiotherapy, which may be criticised as insufficient, it is fairly well established that tumors which will react favorably to x-rays or radium, do so at once with symptomatic relief, while the others are better off with immediate surgery, without the delay incident to a really complete "course" of radio-therapy. The delay of five weeks in establishing the diagnosis is considered short, as compared with the duration of the lesion, which was at least eighteen months. There was time for "therapeutic" roentgen radiation, but as the radium showed no appreciable results, x-rays would in all probability

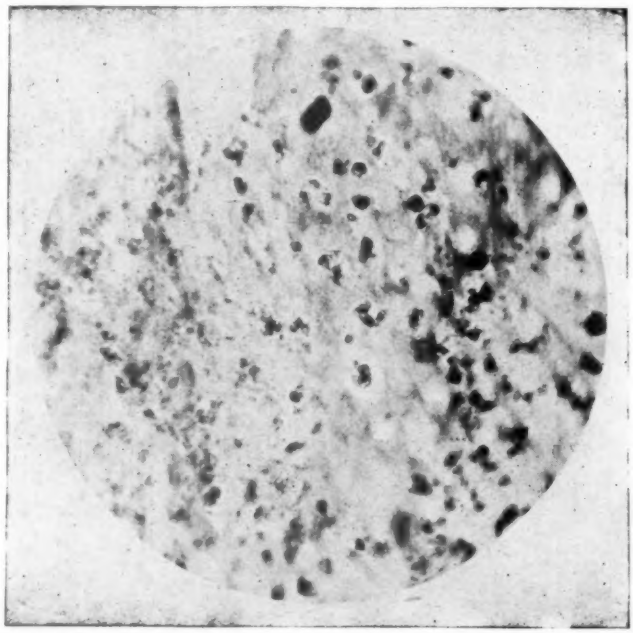

Fig. 21.—Case VI. High-power microphotograph showing necrosis of cells in a myxomatous area.

have been no more helpful. Again, in view of the small percentage of cures, a radical operation should not be done unless the diagnosis of malignancy is firmly established, and an exploratory operation with a frozen section, may be necessary before this can be done, as in the next case.

(For a case quite similar to this one, see Reference 1, Fig. 1, and page 175).

CASE 7—(X-ray No. 11138)

White male; age, 25; lieutenant of infantry.

History

Complained of swelling of stump of left thigh, said by patient to be torn muscles. Condi-

tion dated from injury to stump. Duration of pain, swelling and disability, all three months. *Past History*: While in a hospital for treatment of pulmonary tuberculosis in March, 1918, the patient noted a painful swelling of the first phalanx of his left great toe ,which disappeared and reappeared four times until it finally became constant in December, 1918. As he was in bed it caused him no inconvenience and it was not until August, 1919, that it troubled him, 17 months after the first symptom. At this time a diagnosis of osteomyelitis was made (see Fig. 23) and the toe curetted. A blood filled cyst was found in the bone, and as the wound did not heal, the toe was amputated about two

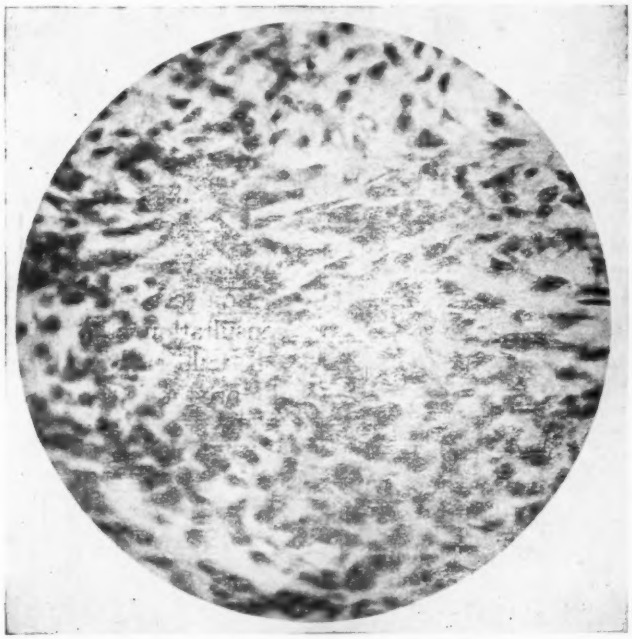

Fig. 22.—Case VI. High-power microphotograph showing large round and spindle cells which should be looked upon as sarcoma, in typical myxomatous tissue.

months later. From this a section was made which was diagnosed sarcoma. Seven weeks later (Nov., 1919), the entire foot became swollen, and on x-ray examination metastases to tarsus and condyle of femur were found. On account of these, amputation was performed through the middle third of the thigh, and the patient was then sent to our hospital for a prosthesis. At this time, December, 1919, a lump appeared in the left groin, swollen, red and painful, which disappeared entirely under radium therapy and has not returned. The x-ray examination

of the stump, pelvis, spine and chest were negative for metastases and again negative after a three months period. In May, 1920, he was returned to his

Fig. 23.—Case VII. X-ray showing original lesion in toe.

original hospital wearing a permanent artificial limb. In July, 1920, he "twisted" his stump in a minor accident, and a few days later found that he was unable to wear his leg comfortably, due to a lump on the arterior aspect of the stump, which was tender and quite painful on motion. On second admission a large, firm, smooth swelling was found on the antero-lateral aspect of the middle third of his thigh stump firmly fixed to the bone, but not to the skin, and apparently involving the soft parts. Tender on pressure and painful on motion. No evidence of glandular involvement.

Examination

X-rays showed (Fig. 24), a large cystic defect in the femur just below the lesser trochanter, with almost explosive destruction of the cortex, the latter apparently in part due to a pathological fracture through the involved area. Examination of the chest showed several small nodules in the base of the right lung, not seen when the plates of the previous spring were compared with the present ones, and a diagnosis of metastatic sarcoma involving femur and lung was made. Unfortunately, we did not at that time have his previous x-rays or section of the tumors, and on consultation the possibility of tuberculosis was suggested. As the prognosis, in the case the lesions were sarcomatous, was poor,

Fig. 24.—Case VII. X-ray of stump of left femur. See text.

an exploratory operation was done, October, 1920. (Major Kirk). A large blood filled cyst was found (Fig. 25), with the "velvety" lining of tumor tissue, a section of which was reported as sarcoma. Amputation was then done three days later, with no attempt at chemical or electrical cauterization of the original

Fig. 25.—Case VII. Longitudinal section through tumor showing large hemorrhagic cyst with marked bone destruction. Tumor tissue was friable, soft and hemorrhagic. Type of malignant hemorrhagic bone cyst.

wound. Further microscopic study (Figs. 26 and 27), confirmed the diagnosis of sarcoma, of the endothelial type, which not infrequently metastasizes to bone. (Bloodgood). On comparison of the tissue from the toe and from the stump, the latter is more cellular, more vascular, the cells stain more deeply and appear younger, indicating some increase in malignancy.

Treatment

In spite of the poor prognosis, deep roentgen therapy was begun on the chest (the stump having had one "course" prior to operation), and the entire lung field thoroughly and heavily radiated. The small nodules in the base can now hardly be found, appearing fibrosed, and, although quite sick after the intensive treatment, the patient is now in gairly good condition, with no signs of recurrences. There was an immediate gain in weight and a general improvement, so that the prognosis at present is much better than before operation.

Discussion

This case is somewhat unusual in that it began as a central tumor of a phalanx (these tumors forming only a small portion of bone), and is one of the few malignant tumors originating in a phalanx to be put on record. It also shows an unusual spread, by metastisizing primarily to bone and to the bones of the same limb in an ascending sequence. The only other involvements noted were the inguinal glands on the same side and the base of the lung, neither of which has been proven to be tumor tissue. In addition it demonstrates the rapid response to radio-therapy found in some tumors not belonging to the lymphomatous group, which,

of course, respond best of all to this form of treatment. In view of this it is possible that a thorough treatment of the original lesion with x-rays or radium would have prevented the subsequent metastases, especially if curettement had not been done. This in turn shows the necessity of recognizing the type of tissue which is met, even in such a minor operation. The finding of a blood-filled cyst in the bone should have suggested the possibility of malignancy, and a resection of the tissue should have been made at once.

In conclusion we wish to thank Dr. Bloodgood for his extremely valuable assistance in the study of these cases, and the officers of the surgical and laboratory services of this hospital for their hearty coöperation. We are indebted to Mr. Herman Shapiro, of Baltimore, for the excellent reproductions of the x-rays and gross and microscopic sections.

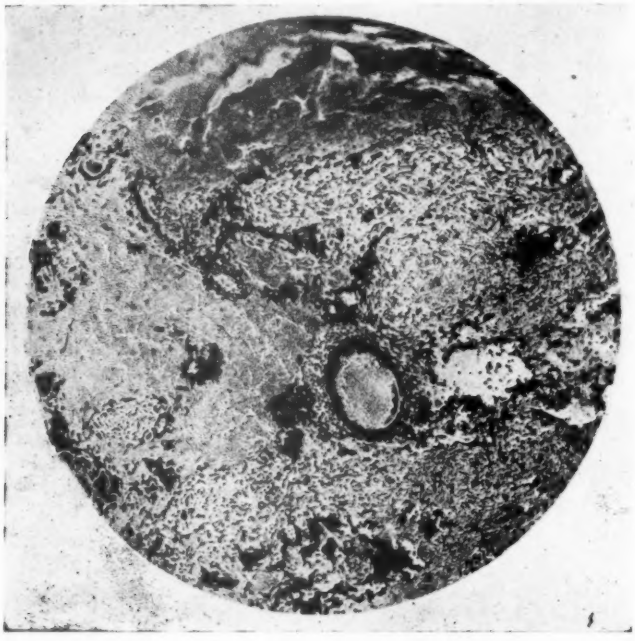

Fig. 26.—Case VII. Low-power microphotograph showing small nests of medium-sized round sarcoma cells with much blood. Blood vessels with tumor cells in lumen and outside.

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Fig. 27.—Case VII. High-power microphotograph showing many small blood vessels. Tumor cells uniform in morphology. Suggests angio-sarcoma.

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The Treatment of Tuberculous Cervical Adenitis — Results From Use of Fractional X-ray Dosage in One Hundred Cases

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THERE are two laws which should govern the physician in his treatment of disease—First, he should do no harm; Second, he should work in harmony with Nature's modus operandi.

The application of the first law to the treatment of Tuberculous Cervical Adenitis rules out, we believe, their surgical extirpation. For it is inconceivable that the opening up of blood and lymphatic channels resulting from an extensive dissection should not do harm by giving opportunity for the extension of the infection to other organs, particularly the lungs. The x-ray can cure any glands that surgery can remove, with less discomfort to the patient and less danger of spreading the infection. Further, we have cured by the x-ray many cases that have come to us as surgical failures. The only indication for surgery is where a caseous gland has broken down through having become secondarily infected, or through liquefaction necrosis, and is pointing at the skin. Then the detritus or the pus should be evacuated by the smallest kind of skin incision.

The consideration of Nature's second law—that the physician should imitate Nature's methods, together with the study of the pathology of tuberculous glands, has led us to depart from the commonly taught method of using x-ray in the treatment of tuberculous glands of the neck, viz., intensive treatment by hard filtered rays. The U. S. army x-ray manual (1) recommends for the treatment of tuberculous adenitis "intensive or semi-intensive filtered treatments." The kind of ray recommended for filtered treatments is (2) a "9-inch gap." Pancoast (3) says of tuberculous adenitis, "deep penetration and filtration are to be employed." These expressions are representative of the American literature on this form of x-ray treatment.

Now, we do not believe that the hard x-ray, represented by the 9-inch gap, produces results as much in harmony with Nature's method of healing tuberculous glands as does the milder ray, with shorter spark gap. The hard ray accomplishes its results by the destruction of rapidly proliferating tissue, especially of embryonal type. It has made its great achievements in the malignancies and in the pathological hyperplasias, notably those of the

thyroid gland and the fibroids of the uterus. In tuberculous glands, however, the destructive process and the process of repair are of quite a different order from that of the neoplastic type of disease. The hyperplasia here is not a destructive process, but is a part of the process of repair, and should be stimulated rather than inhibited.

Further, in the proliferating embryonic type of tumor the indications are to cut off the blood supply, and this the hard ray does by destroying the intima of the arterioles, with resulting thrombosis. On the other hand, in tuberculous glands the indications are to increase the blood supply, to supplement the hyperemia, which nature produces, by the stimulating effect of the milder forms of x-ray.

Adami and McRae (4) thus describe the destruction process and mode of repair of tuberculous glands "as a result of the invasion of the gland by the tubercle bacillus, a mild protective inflammatory process is set up." This process consists of:

1. Simple cellular hyperplasia.
2. Tubercle formation; agglomeration; caseation resulting from the tubercle bacillus toxins; and possible liquefaction necrosis, or breaking down as a result of secondary infection.
3. Thickening of the capillary walls, the fibrous stroma of the gland, and the fibrous capsule of the gland, which may be so extreme as to cause atrophy of the lymphoid elements.
4. Deposit of calcium salts in the caseous gland.

The hyperplasia of lymphocytes is nature's primary defensive mechanism in the acute stage; the hyperplasia of fibrous tissue elements is the subsequent method of defense. Both these are essentially defensive measures and should not be interfered with. We believe they are retarded by the destructive tendency of the hard ray, and stimulated by the ray of medium softness.

Erskine (5) says: "With a short spark gap only soft rays are produced, with a medium spark gap more soft rays and some medium rays, while by using a long spark gap we get many more soft rays, more medium rays, and some hard rays." And from the premises he draws the conclusion: "By using a long spark gap we obtain a beam of light with the widest possible range of penetrative power, especially rich in soft and medium rays, and adaptable by means of filters to every therapeutic requirement." Now, it is generally conceded that the heavy filtration, required when the long spark gap is used, cuts out larger relative proportions of soft and medium rays, and lets through proportionately more hard rays. So that the characteristic effect of the ray produced by the long spark gap seems to be, not that of the mixed rays, but that of the hard ray. We think it is more in harmony with nature's method of healing tuberculous glands not to use this hard de-

structive ray, produced by the 9-inch spark gap, but to use the medium stimulating ray produced by the 5 or 6-inch spark gap. The fibrous chains of glands which are the results of infection extending over years, and in which the tuberculous process is arrested, may be the proper field for the hard rays. But we are convinced that the acute or subacute inflammations which form the bulk of our cases, should receive only the medium rays, especially since no one attributes to the x-ray the power to destroy the tubercle bacillus.

This conviction is confirmed by several other considerations:

1. Certain unfortunate experiences. Recently a medical confrere from an adjoining town desired a heavy treatment of an acutely infected gland, as he could not report again in less than a month. Contrary to our best judgment we gave him a highly filtered intensive treatment. The result was that we set up a terrific reaction, which nearly prostrated our doctor patient for a period of two ensuing months. Again, a patient in whom the large acute swelling had subsided under twelve mild treatments, was given a course of intensive treatments to absorb the hard gland remaining. The result was a prompt recrudescence of the acute inflammation.

2. A second consideration, suggestive of the value of medium rays in this condition, is the good results obtained in many sanatoria through the treatment of surgical tuberculosis, including tuberculous glands by heliotherapy. Now heliotherapy is a much less stimulating form of treatment than even the mildest forms of x-ray. And yet I am told by the superintendent of one of these sanatoria that they must be careful even in the use of heliotherapy, because of the dangers of overstimulation and the flaring up of acute symptoms.

3. The third consideration, confirming our conviction of the value of medium rays, is the uniformly good results which we have personally obtained by their use in the treatment of the one hundred cases which we now report.

If we would summarize our idea of the kind of x-rays to use in tuberculous cervical glands, we would say—The rays should be as soft as consistent with thorough penetration and safety to overlying tissues. Our problem then is, what is the lowest spark gap which will enable the rays to overcome the two-fold resistance—first, that of the tissues overlying the cervical glands; second, that of the filters necessary to protect the overlying skin.

The tissues overlying the cervical lymphatic glands and interposing resistance are, the skin—when the glands are post sternomastoid—and the skin and sternomastoid muscle, when the deeper

glands underlying that muscle are involved.

Warner (6) has demonstrated by the ionization method, using a 5.5 inch spark gap, that a thick skin will absorb rays equivalent to that absorbed by .70 mm. of aluminum, while beef-steak 20 mm. thick is equal in absorbing power to 1 mm. aluminum. On this basis the resistance of the sterno-mastoid, which will average about 6 mm. in thickness, would be the equivalent of .30 mm. aluminum. The total overlying structures of the cervical lymphatic glands would represent the filtration effected by .70 plus .30 equals 1 mm. aluminum.

In addition to this resistance by the overlying tissues, we must take into consideration the resistance offered by the filtration necessary to protect the skin. This factor, which we estimate at 2 mm. aluminum for the 5 or 6-inch spark gap ray, can readily be determined by experimentation along the lines mapped out by McKee (7). Remer and Witherbee (8) who have worked out what they term "the arithmetical method of computing x-ray dosage."

They find that the law for filtered dosage differs from that for unfiltered dosage. The formula for unfiltered dosage is—spark gap times milliamperage multiplied by time, equals square of focal distance. The formula for filtered dosage is—spark gap times milliamperage multiplied by time, focal distance. While the unfiltered dose varies inversely as the square of the focal distance, the filtered dose varies inversely as the focal distance. On this basis they find by actual experimentation the formula for a skin dose when a 2 mm. aluminum filter is used to be $\frac{21}{2}$; while the formula when a 3 mm. filter is used is $\frac{231}{20}$.

It is interesting to see how the technique we have adopted. for treatment of tuberculous cervical glands measures up with these formulae. As stated above, we use 2 mm. aluminum filter. Our formula is as follows: 5-inch spark gap times milliamperage, 4 multiplied by 5 minutes time, equals 10-inch focal distance, or $\frac{100}{10}$.

It will be seen that this formula represents a skin dose underneath the 2 mm. filter, $\frac{100}{10}$ being almost the same as $\frac{21}{2}$; but it represents only $\frac{7}{8}$ of a skin dose in the glands, underneath the 3 mm. filter—the overlying tissues forming the additional mm., since $\frac{100}{10}$ is about $\frac{7}{8}$ of $\frac{231}{20}$. The difference in focal distance between the skin and the gland is so small as to be neg-

ligible for practical purposes.

This technique, while using the spark gap distance that we consider the best to apply in treating tuberculous glands, furnishes as nearly a skin dose to the glands themselves as it is possible to give and not overstep the bounds of safety for the overlying skin. That the technique will be criticised, by those who use and teach deep therapy for everything, we quite expect. But there is one thing which is beyond criticism, and that is the statistics which we furnish of nearly one hundred per cent cures in a long series of cases, going back over a period of about ten years.

Before treating an enlarged inflamed cervical gland with x-ray, one must know that he is dealing not with a secondary infection from some pus forming organism, but with a tuberculous process. It is our practice to determine this in every case by using the tuberculin test, giving from three to fifteen milligrams of old tuberculin subcutaneously.

There are certain general measures, common to the treatment of all forms of tuberculosis, that should be carried out in dealing with tuberculous glands, such as the open air life, good feeding, and plenty of rest.

It is a matter of first importance to locate and remove any foci of infection. These will usually be either the tonsils or the teeth. The tonsils may be the site of entrance of the tubercle bacillus, or the seat of a pus infection which is secondarily involving the glands through lymphatic drainage. In either case, the tonsils, if showing any evidence of disease, should be removed. Infected teeth may be furnishing the pyogenic organisms which are secondarily invading the tuberculous gland, and interfering with the healing effects of your therapeutic measures. A very vivid realization of this fact was experienced by us when a patient, who had received seven treatments with no improvement in the gland, removed to another city, and was promptly relieved of her enlarged gland following the extraction of a diseased tooth. We are forcibly impressed, in tabulating this series we are now reporting, with the large number of cases that did not respond to treatment until tonsils or other foci were removed.

Another measure which we regard as of cardinal importance is the hypodermic use of tuberculin. Various members of our clinic have had long experience in the use of tuberculin, having employed it continuously for the last fifteen years with almost unvaryingly good results. It is one of the lines of treatment which we would not like to do without. We are quite aware that there has been a great deal of criticism offered concerning the therapeutic use of tuberculin. We believe that criticism is

largely based upon incorrect methods of administration. There are two ways of using tuberculin, just as there are two ways of using the x-ray. The one way is to stimulate reactions, and the other way is to stimulate metabolism and the process of immunization. We believe that in the therapeutic use of tuberculin, especially in the early stages, the dose should be kept below the point where it gives systemic reactions to the patient. Failure to observe this is responsible for much of the unsatisfactory experience some have had with this agent. We use the bacillen emulsion, beginning with two minims of the lowest dilution, and increasing according to the degree of immunity of the patient as evidenced by the presence or absence of reaction.

Coming now to our x-ray technique, we use the formula described above. giving one treatment every five to seven days until there is marked decrease in the size and inflammatory condition in the glands. Then the period between the treatments is extended to two weeks, and they are continued thus for a period of six to nine months. This continuation of the treatment after the glands have subsided is the crux of the whole situation. If you let your patient go after you have given eight or ten treatments, which we find is the average number required to reduce the glands to normal size, you may look for recurrence. We tell our patients that any one who is healed of a tuberculous process of any kind in from one to two years is a very fortunate individual. The healing of tuberculous glands goes through the same stages as the healing of a tuberculous process in the lungs. There is the period of quiescent symptoms, followed by the period of arrested progress, followed by the period of apparent cure. These periods extend not over weeks. but months, and you can no more heal a tuberculous gland in a day than you can a tuberculous lung. The patients in this series, who continued the treatment until they were discharged as cured, received an average of twenty-four treatments each, extending over an average period of ten months.

We have seen telangictasis in only one case, and that was produced in the early days when the gas tube was used, and we did not understand the necessity of never producing an erythema of the skin.

During the course of the treatments about ten of the glands broke down and required evacuation. This was done through a very small skin incision, which promptly healed. We have had no case of an unhealed tuberculous sinus.

We have records of recurrence in only two cases, where the patients had been discharged as cured. These cleared up on

further treatment, and remain so at this date. That this is conclusive as to the glands remaining healed, is evident, when it is noted that in about thirty of the cases the cure dates back over five years.

In only two cases was there anything to indicate that our treatment might possibly have any relation to a spreading tuberculous infection.

In one case a boy of four received three treatments, one week apart, over a large softened caseous gland. In a few days after the last treatment he developed a tuberculous meningitis and died.

A young lady received eighteen treatments over a course of six months, contracted "the flu," developed acute miliary tuberculosis of the lungs, and died in a sanatorium.

We do not believe there is any causal relation between the x-ray treatment and the spreading infection in these two cases.

Five patients changed their residence and transferred their treatment to other radiotherapists. Six patients failed to follow up the treatments after they had made but a beginning. Eleven patients are continuing the treatment, progressing favorably, but not yet ready to be discharged as cured. The balance of the hundred have been discharged by us as apparently cured. The glands have been reduced to the merest kernels, and the general condition of the patients has been restored to one of well-being.

In conclusion we wish to make it clear that we do not in any sense disparage deep therapy. In certain forms of malignancy, in hyperplastic thyroids, in the hemorrhages of the menopause dependent upon fibroid changes in the uterus, we have achieved through deep therapy results so brilliant that we have come to regard it as almost a specific. But we should not let our enthusiasm for deep therapy prevent us recognizing the good results obtained by milder types of x-ray treatment. The advent of the Cooldige tube, which has done so much for deep therapy, has also standardized our technique for the milder therapy. And this report is simply a statement of our experience with that standardized milder therapy in the treatment of tuberculous cervical adenitis, where we have demonstrated its ability to achieve such uniformly good results.

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History and Development of Radium-Therapy

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RADIUM was discovered by the Curies in 1898, and an action by the radium rays on the skin was first recorded by Walkhoff in 1900 (Photogr. Rundschau, Oct.) Giesel a little later (Ber. d. d. Chem. Ger. 33, 3570, 1901) described an experiment wherein, after a two-hour action by 0.27 gm. of a radium preparation, enclosed in a double celluloid capsule, and applied to the inner surface of the forearm, there was a very intense reaction with pigmentation after two to three weeks, followed by vesiculation and scabbing as in case of a burn. Following the healing, the hair did not grow on the rayed spot. Becquerel in 1901, while using a very active radium preparation, carried the tube in his vest pocket for several hours. Several weeks later a severe inflammation of the skin appeared, which was attributed to the action of the radium. Prof. Curie then made an experiment on himself, and as a result of the discovery of this new property of radium, loaned a specimen of radium to Dr. Danlos, of the St. Louis Hospital, Paris, for medical purposes. In 1901 Danlos reported on the treatment of lupus erythematosus by radium chloride (Soc. franc. de dermat. et de syph. Nov. 7).

As rapidly as the amounts of radium available permitted, the experiments in the use of radium were taken up by other workers in Europe, and America, and in the years up to 1910, radium treatment was favorably suggested for many conditions, including many malignant and benign growths. During this early period the main contributors were the French and German schools, the English and American contributions being much fewer in number. In this country we may mention the pioneer work of R. Abbe (Radium in Therapeutics, Boston Med. and Surg. Jour., 53, 1904); Wm. J. Morton (Treatment of Cancer and Lupus with Radium, Med. Record, Nov. 9, 1907); Williams, of Boston, (Early Treatment of Some Superficial Cancers, especially

Epitheliomas, by Pure Radium Bromide rather than Operation or x-rays, J. A. M. A. 51, 894. 1908) and H. Robarts (Practical Radium, The Causation of Cancer and Its Curability by Radium. The Practical Uses of Radium in the Treatment of the Obstinate Forms of Disease. St. Louis, Mo., 1908). The writer has not had an opportunity to go into the work of the pioneer radium therapists in the country and simply mentions the names of men whose work has come to his attention.

During the first ten years of its development radium therapy struggled with two great difficulties which made advances in the work very slow. These were the small amounts of radium which were available for the work and the lack of a suitably accurate method for standardizing radium preparations for therapeutic use.

In order that there might be greater accuracy in the standardization of radium preparations, the Congress of Radiology and Electricity, meeting in Brussels in 1910, appointed a committee to make arrangements for the preparation of an International Radium Standard, and Mme. Curie was asked to prepare the standard. This, as made, consisted of 21.99 mgm. of pure radium chloride, sealed in a thin glass tube. In March, 1912, this standard was compared by the committee, meeting in Paris, with similar standards made by Hoenigschmid from pure radium in the possession of the Institute for Radium Research of the Vienna Academy of Sciences, the material for the Vienna prototypes having been purified for atomic weight determinations, the three tubes containing 10.11, 31.70 and 40.43 mgm. of radium chloride, respectively. Comparison of the Curie tube with the Vienna tubes showed that the preparations agreed within the limits of the errors of measurement, and certainly within one part in three hundred. The standard prepared by Mme Curie was accepted as the International Radium Standard and is preserved at the International Bureau of Weights and Measures at Sevres, near Paris. Duplicates of the International Standard have been prepared for use by the governments of the world, that for the United States being in the possession of the U. S. Bureau of Standards, at Washington.

Along with the new radium standard came the more general use of the gamma ray method of comparing quantities of radium, and this advance has been of the greatest importance in permitting physicians to know exactly with what they are working, and so make it more readily possible for the accurate description of their methods, and for the duplication of their work by others. This was not possible with the older method of standardization (the

so-called activity units) where each radium applicator had to be physiologically standardized.

The radium production from Bohemian pitchblende was maintained as a government monopoly by the Austrian government, and the independent production of radium in France and Germany up to 1914 was mainly from ores which were imported, high grade carnotite from Colorado being, in the several years prior to the outbreak of the European war, the main source of radium. Even this ore, according to the statistics, could not in the aggregate have yielded any very large amount of radium. (Less than 25 grams probably). (See U. S. Geol. Survey Report for 1914, Report on Uranium, Vanadium and Radium, by F. L. Hess). In the United States, Lockwood, of Buffalo, N. Y., had worked from 1903, in a vain effort to produce high purity radium salts, and it was not until 1913, that the first high grade radium was prepared in this country in the laboratory of the Standard Chemical Company, at Pittsburgh. Since 1914 the production of radium has been carried on mainly in this country, carnotite being the source, and it is conservatively estimated that to date (June, 1920), the total aggregate production in the world of high grade radium salts probably does not exceed one hundred and thirty grams of radium element contained, and of this amount between eighty and eighty-five grams have been produced in the United States. While the figure for the world's total production is in the nature of a guess—the figures for the production in this country are reasonably accurate, since for example it is known that the Standard Chemical Company, of Pittsburgh, has produced over 55 grams to date.

Prior to 1912 the most extensive work in radium therapy was that of the French School, of whom we mention Drs. Danlos, Beclere, Darier, Dominici, Wickham, Degrais, Barcat, Chevrier, Cheron, Rubens-Duval, Fabre, Oudin and Verchere, Faure-Beaulieu, Bavet, and de Beurmaun. Other pioneers worthy of special mention are Abbe, Williams, Davidson, Lassar and Blaschko.

The indications for radium in various conditions, as given by Dr. Barcat in his Precis de Radiumtherapie (Paris, Maloine, 1912) are noted here, together with the name or names of those who first reported the treatment.

Cutaneous cancer, lupus vulgaris, lupus erythematosus, port wine stains, psoriasis, Danlos, 1902. Leucoplakia, Rehns and Salmon, 1904. Keloids, Williams, Werner and Hirschel, 1904, Wickham and Degrais, 1908. Sycosis, acne rosacea, lichen ruber, Blacshko, 1905. Eczema, Lassar, 1904, Blaschko, 1906, Wickham and Degrais, 1906. Warts, Abbe and Boikoff, 1904.

Pigmented nevi, Hartigan, 1904. Epithelioma of the Mucous Surface of the Lips, Dominici, 1908. Epithelioma of the Buccal Mucosa, Gussembauer, (1 case); Abbe, (2 cases); Dominici, (6 cases). Epithelioma of Tongue, Dominici. Angiomas, Wickham and Degrais, 1906. Mycosis, de Beurmann, Dominici and Rubens-Duval, 1907. Vanthoma, Barcat and Bord. Rhynophyma, Wickham and Degrais, 1909. Breast cancer, Lassar, 1904, Abbe, 1905, Hartigan, 1905, Morton, 1907. Sarcoma, Morton, 1905, Dominici, Haret. Cancer of Cervix, Fibroids, Abbe, 1905. Fibromas and Metrorrhagia due to Fibroids and Metritis, Oudin and Verchere. Later works by Dominici, Cheron, Rubens-Duval, Wickham and Lacapere, Fabre and Bender. Cicatrization of wounds, Chevrier. Exophthalmic Goitre, Abbe, 1905.

Following the experiments of Danlos, the crude applicators were modified by later workers, many of the forms employed being still in use today. The varnish surface plaques were introduced by Danne, and the metal tubes, filled with radium salt are credited to Dominici. These tubes with a sharpened point served for introduction into tumors. For lighter treatment over large areas the flexible linen, or "toile" applicators were made. Dominici first showed the importance of metal filters or screen to absorb the undesirable irritating soft rays, when treating growths requiring considerable irradiation, this method being called that of the "surpenetrant" or ultra-penetrating radiations.

In 1912 there were already a number of radium institutes where therapeutic treatments with radium were being carried on extensively. The most important at that time, in point of experience, was probably the Laboratorie Biologique du Radium, in Paris, under the direction of Dr. Louis Wickham, assisted by Dr. Degrais. Second to this ranks the work at the Hospital St. Louis, Paris, of Dr. Dominici. At Heidelberg, under the direction of V. Czerny, a radium department carried on work, and at the General Hospital in Vienna, in 1912, a radium department was established with half a gram of radium element available. In London, in August, 1911, there was opened the Radium Institute, under the direction of a committee of leading surgeons. A. E. Haywood Pinch being the medical superintendent. This institution was credited with owning two grams of radium bromide, the largest amount then available at any one clinic in the world.

In 1913, the medical world was thrilled by the reports given at the Gynecologic Congress at Halle, when Kroenig and Gauss, Bumm, and Doederlein reported their astonishing results obtained by the use of massive doses of gamma rays from heavily screen-

ed mesothorium preparations in the treatment of carcinoma of the cervix uteri. A "radium fever," as it was called, came over Europe, particularly in England, Germany, Austria and Italy. The production of radium on a larger scale, which began about this time, could not begin to meet the demand. Funds were raised by public subscriptions to endow hospitals with sufficient radium, and many of the governments of states and cities provided funds for the same purpose. In Manchester, England, public subscriptions secured a gram of radium element for the Radium Institute, and in a like manner, a half gram of pure bromide was secured in Sheffield, England. The Prussian government purchased a gram of radium element, the Bavarian government a half gram, and a great many of the German cities likewise purchased quantities of radium for use in the local hospitals.

In the United States radium therapy was not received very cordially at this time. A few men, like Abbe, Kelly, Simpson, Aikins, and Dieffenbach, were working in the field, but few would believe their statements. Then came the war in 1914, with its upsetting of communications. During 1915, and in spite of the adverse propaganda of the Bureau of Mines, more and more the American physicians came to realize the importance of radium therapy, and backed their belief by securing the precious material for use in their own practice. The poor communication with Europe, due to the war, the fact that the literature of radium therapy was largely in German and French journals, not accessible to very many, resulted in an American School of Radium Therapy, which rediscovered, and improved on many of the results of the pioneers. It would go beyond allowable limits were the writer to try to indicate these points in detail as it has been his privilege to observe the development of radium therapy in the United States since 1913. Intelligent understanding of the limitations of radium therapy, coöperation between the surgeon, the roentgenologist and the radium therapist have gone far to work for improved results, and combined methods, rather than reliance of a single means, give hope that radium therapy will go far in the combatting of cancer.

The writer would like to mention the splendid research work which is being carried out at the Memorial Hospital, in New York, and where Dr. Janeway is developing the method of employing radium emanation tubes inserted directly into the tumor growths. This promises to be one of the most important advances made in radium therapy, and if later observations confirm the earlier ones, this work will materially influence the trend of

radium therapy in this country. Radium emanation is only readily available where rather considerable quantities of radium are employed, and a demand for radium emanation will force the physicians to coöperate to pool their supplies for the more economical production of radium emanation.

There are in this country two institutions which each possess for regular work over four grams of radium. There are to the writer's knowledge four with a gram or more in use and seven with over a half gram. A conservative estimate at this time places the number of physicians, hospitals and institutions in this country who are employing radium at four to five hundred, and the total quantity of radium employed at between thirty-five and forty grams. Based on present production, which, of course, can be greatly increased if necessary, additional radium is available at the rate of from twenty to thirty grams per year.

An estimate of the amount of radium necessary for all likely therapeutic uses, for the whole world, would probably be a large figure in terms of the present day's stock and rate of production of radium. There have been recently a number of disquieting statements by Dr. R. B. Moore, of the Bureau of Mines, indicating that the radium supply of the world and particularly that which will come from the Colorado carnotite is painfully small. The writer has been arguing this matter with Dr. Moore since 1914. at which time Dr. Moore's predecessor, Dr. Parsons, said in a hearing before a Congressional Committee that "we cannot estimate as much as 200 grams of radium metal available in any known deposits at the present time." Without in any wise exhausting the Colorado carnotite field, or barely touching the Utah deposits, over eighty grams of radium have since been produced. In spite of Dr. Moore's pessimistic view, there is other better evidence that several thousand grams of radium will be obtained from the carnotite deposits. It is, therefore, unlikely that radium therapy will languish for lack of sufficient radium.

This country now leads the world in all fields, with the largest known radium deposits, the largest manufacture of radium, the greatest institutes for radium therapy, and far and away the largest amount of radium thus employed.

*—Read at meeting of Iowa Roentgen Club, Iowa City, April 15, 1921.

Atrophy of Lymphatic and Tonsilar Tissue by Radium and X-Ray

C. Agustus Simpson, M. D.
Washington, D. C.

FOR some years it has been known that lymphatic tissue is very much more susceptible to x-ray and radium than connective tissue or bone.

The thymus gland may be taken as a typical example of a lymphatic organ. Another example is the tonsil. Both glands are composed almost entirely of pure lymphatic tissue, the fundamental pathology being essentially the same.

In 1915 I did some experimental work on half grown guinea pigs and rabbits to see what the effects of x-ray would be on the thymus gland of these animals.

The controls were pigs and rabbits of the same litter, approximately the same size and weight and living under the same conditions.

The technique employed was to give 3 points Hampson radiometer each day for eight days through 1 M.M. aluminum, pastile on the skin. My apparatus consisted of a 16-inch coil using 9-inch spark gap, 5 millamperes current Coolidge tube target 10 inches from the animal.

One week after the completion of treatments the control and treated animals were killed, the thymus gland removed and sectioned by Dr. Hunter, of George Washington Medical School.

Microscopically the treated glands could be divided into a capsular and an interstitial hyperplasia, both increased to a marked degree leading to a distinct sclerosis and enormous reduction in the amount of thymic tissue. The capsule was in places increased to six times the thickness of the capsule in the untreated gland.

The veins, arteries and capillaries were widely engorged with thrombi and organized blood clot and the walls of the vessels were much thickened, all pointing to future organization of the vessel contents.

In addition to this, there was a decided thickening of the trabeculae and a great increase in the reticulae all taking place at the expense of the thymic cells, in other words, a rapid and unmistakable atrophy of the lymphatic tissue associated with an increasing amount of connective tissue and sclerosis of the entire gland.

Satenstein and Remer have recently studied the varying sensitiveness of the different tissues of the body to x-ray, the degree of sensitiveness being most marked in the lymphocytes and less

marked in the fibroblasts and connective tissue cells, both being more resistant to the ray than neoplastic elements (epithelium) (as cancer) which in turn was much less resistant and more sensitive to x-ray than normal tissue.

In saying it is less resistant to the ray I mean that the tissues are unable to withstand the heavy doses of ray so that involution, absorption and atrophy in this case of lymphoid tissue results without permanent damage to the surrounding and very much more resistant connective tissue.

From the Rockefeller Institute and Journal A. M. A., January 22, 1921, a report has recently been made that will prove a land mark in the treatment of hypertrophied tonsils. This article, coming from such an ultra-scientific and ethical institution and men, is not to be questioned or doubted. Briefly, it told of the treatment of forty-six patients ranging in age from 3½ to 45 years by exposing the area of the tonsils to a massive dose of x-ray. Two weeks later distinct shrinkage of the hypertrophied tonsil was noted. This continued from one to two months, at which time the tonsillar crypts had opened and drained, and in all but a few the exudate had disappeared from the troat, leaving the tonsil smooth, pale and of a healthy appearance.

Cultures were made from the crypts in forty of the forty-six patients before and at intervals after the treatment began. The common organisms of the throat were not affected. Thirty-six of the forty patients showed hemolytic streptococci, and of this number the tonsil of thirty were free of this organism four weeks after treatment began.

As the atrophy of the tonsil progressed the crypts became more shallow and drained better, the streptococci disappeared and the lymphatic tissue became displaced by connective tissue. The hypertrophied tonisls had undergone a shrinkage comparable to the atrophy of old age when the gland is composed of little more than a small collection of fibrous tissue.

Viewing the treatment from the point of a roentgen therapeutist the entire technique is most simple and easily accomplished in one or two treatments

The measured amount of ray over the tonsillar area is less than that given for a skin cancer and averages the quantity used in the treatment of ring-worm of the scalp, or in other words, a perfectly safe amount of x-ray.

The one thing, and to my mind the only part of the technique that detracts from the treatment is the fact that the target or tonsil being at least an inch or more below the surface of the skin, especially in adults, and not in a very accessible or exposed

location may not receive the full amount of ray intended for it. This would entail more visits, treatments, expense, and the loss of time of at least one month or more, as such large doses of x-ray cannot be safely repeated under four weeks.

In order to overcome this difficulty and to be able to concentrate the rays accurately and directly on the tonsil, obviating the use of large doses of x-rays over the structures of the neck, to save time and to make doubly sure of the results, I am using a flat dermatological 30 mg. double strength radium applicator, covered only with a single layer of sterile rubber tissue. Swabbing the throat and tonsil with a two per cent novocain solution will usually eliminate any gagging.

A convenient handle is supplied with the applicator which enables the patient to hold the unscreened radium directly on the tonsil for an hour. With this original technique it is perfectly remarkable how quickly the tonsil begins to shrink and show other atrophic changes. A mild reaction which turns white is to be seen where the radium has been held. This slight irritation of the tonsil disappears in two or three days.

In one patient with a temperature of a hundred and one degrees, exudate in the crypts of the enlarged protruding and inflamed tonsils, cervical glands of the neck the size of half an orange associated with malaise loss of appetite the picture was changed in one week and after a single treatment. After two weeks the tonsil was the only part of the entire naso-pharyngeal field that did not share in the very acute red, inflamed condition that involved every other part of the posterior-nares and pharynx. The enlarged glands had disappeared in three weeks, and only a small part of the tonsil was to be seen when the anterior pillar was pulled to one side. On the opposite side, not complicated by enlarged cervical glands, the enlarged protruding tonsil had entirely disappeared after a single exposure of x-ray and radium.

By using the unscreened radium applicator on the surface of the tonsil combined with three points Hampson x-ray through three M.M. aluminum pastile on skin and covered with two layers of shamois skin externally, I get a cross-fire of radium and x-rays which is concentrated and centered on the tonsil itself.

This technique to me seems a much more scientific and accurate, a sure and quicker way of reaching and atrophying the tonsil.

The dermatological flat radium applicator without filters is not only the practical applicator to use, but its advantages are apparent with the most superficial

knowledge of radio-therapy. The radium is on the surface of the metal capsule, having no aluminum to cover it and filter out the valuable beta ray and being of double strength, the strongest made, the effects are immediate and both superficial and deep. All of the more valuable beta rays are available, which is impossible when using, say the popular metal capsules or needles such as are employed in uterine and deep cancer work. This metal capsule employed by gynecologists and surgeons is most frequently made of one-half to one M. M. of silver, which equals in density and filtration power two to four M.M. of aluminum. Such a filter eliminates and absorbs from fifty to ninety per cent of the very type of rays that one seeks to employ in this work. Not only does it waste from half to ninety per cent of the beta ray that is useful and needed, but it prolongs and multiplies the duration of treatment from four to eight times.

(1) From the cases upon which I have tested this technique and the reports from the Rockefeller Institute combined with the rather large experience of six years in producing atrophy of the thymus gland with x-ray, I am positive that I can cause complete atrophy and disappearance of any but a fibrous tonsil in one to three treatments. If the tonsil is very fibrous the change in size will not be so marked.

(2) Eliminating, as it does, any suffering, operation, anaesthetic, hemorrhage and pain, it most certainly will be a popular method of removing the tonsils from patients who have circulatory and kidney lesions, who are unable to give their time for an operation or who prefer a slower, safer and painless destruction of the tonsils. Needless to say that the physician who undertakes this work must be thoroughly familiar with modern, measured x-ray therapy and very well versed with the particular specimen of radium he is using.

*—Read at Mid-Summer Meeting of the Radiological Society of North America at Boston, June 3, 1921.

The Present Status of Roentgen and Radium Treatment of Cancer of the Breast

DRS. GROOVER, CHRISTIE AND MERRITT
Washington, D. C.

BEFORE proceeding to the subject of our paper we would like to bring to your attention some considerations that seem to us of great importance in the evaluation of any method of treatment of mammary cancer. Some of these are mentioned by Ewing in his book on Neoplastic Diseases.

1. In stating the end results of any method of treatment, if the statistics are to be of real value, the results must be tabulated according to the structural types of carcinoma which are present. For instance, it is of very little value to state that of 210 cases of breast carcinoma 42 per cent were cured by radical surgical operation, since a number of the 210 cases might be circumscribed adeno-carcinoma, all of which might have been cured by simple excision. If, on the other hand, we know that of these 210 cases there were 75 per cent of cures in adeno-carcinoma, 48 per cent in medullary carcinoma, 46 per cent in circumscribed scirrhus, 35.5 per cent in small infiltrating scirrhus, and 20 per cent in large infiltrating scirrhus, the statistics become much more valuable to us as a basis for determining approximately what chance we have of obtaining a cure in any individual case by a radical surgical operation.

2. The tabulation must also be based upon the extent of the disease. If one surgeon, for instance, considers only those cases operable in which the axillary nodes are not palpable and another operates even if the supraclavicular glands are enlarged, certainly their results are not comparable. With equal surgical skill the former's percentage of cures must be immensely higher than the latter's.

3. Statistics of cure are sophistical unless in addition to the percentage of cures in the cases treated a statement is also made of the number refused as hopeless. For instance, 100 patients may apply for treatment and eighty of them be considered hopeless and sent away without treatment. The other twenty are treated and at the end of five years ten of them are alive. Whatever method of treatment was used is then credited with 50 per cent of cures, although only 10 per cent of the total number who applied for treatment are then alive.

4. The position of the cancer should also be known, since cancers localized about the nipple are relatively less malignant than those close to or adherent to the chest wall or located in an aberrant portion of the breast.

As a further consideration, in order that we may give this relatively new method of treatment —that is, radiation—its proper place, it is necessary to have in mind a general idea of the value of surgery in breast cancer, because it has been the established treatment for many years. Moore, in 1867, recommended removal of breast, skin, fat, axillary nodes, and pectoral muscle. The operation has been gradually extended by the contributions of surgeons in all parts of the world until there seems little room for further improvement. Statistics show that as the operative field has widened the results have steadily improved.

Formerly it was the custom to report cases cured if they lived for three years after operation without recurrence, but Bloodgood and others showed that a considerable percentage of recurrences take place between three and five years, and a smaller percentage recurs even after five years. At the present time it is the custom to report cases as cured if they live for five years without recurrence of the disease. Figures taken from a tabulation by Deaver, covering approximately the years 1895 to 1912, show the percentage of three-year cures varying between 29 per cent and 44 per cent with different surgeons, while the percentage of five-year cures varies from 21 per cent to 29 per cent. It is seen from these figures that somewhere between 20 per cent and 30 per cent of cures have been obtained in all forms of breast cancer by the radical surgical operation. It must be remembered, however, that these figures represent only the percentage of cures in the cases that were considered operable, and also that these are the results obtained by the leading surgeons of the world. It is probable that the average success obtained by surgical treatment is far below these percentages. Several conditions greatly modify the result of surgical treatment. The most important of these is the extent of the disease. Finsterer reports 275 cases in which the axillary glands were palpable with only 4.3 per cent of cures. Ewing believes that this represents about the average surgical success under these conditions. That is, a woman has about one chance in twenty-five of being cured by operation if she has a mammary cancer with palpable involvement of the axillary nodes. If the supra-clavicular glands are involved the chance is greatly reduced. The Massachusetts General Hospital statistics show 0.5 per cent of cures in such cases, or one in two hundred. Statistics

from the same source show 16 per cent successes when the tumor is adherent to the skin, against 32 per cent when it is not adherent; 11 per cent successful when it is adherent to chest wall, against 21 per cent when not adherent; 6.5 per cent successful when ulceration is present, against 21 per cent in non-ulcerative cases.

A fair statement of the case would seem to be that in an almost invariably fatal disease radical surgical treatment is able to save the lives of about one in every four operated upon. The probability of success from operation is greatly lessened when the axillary or supraclavicular nodes are involved, when the tumor is adherent to the skin or to the chest wall, when there is ulceration, and when the patient is below 30 years of age. On the debit side of the account must be placed the deplorable results, following local recurrence, the unbearable pain, edema of the arm, etc., that make the patient's condition so much worse than before operation. There seems to be no doubt that operation not only increases the suffering, but it also shortens the life of the majority of recurrent cases.

The limitations of surgical treatment have led to the wide use of radiotherapy as an adjuvant in the treatment of breast carcinoma, and what we shall have to say in regard to its proper place and value in this disease is based very largely on personal experience and observation. We have generally followed the prevailing changes in technique which have come into vogue during the past twenty years. This alone, without regard to other equally important considerations, would render such statistical data as we have entirely valueless.

So far as we know, practically nothing has ever been attempted in the treatment of cancer of the breast by radio-therapy alone other than in inoperable cases. It is in the latter group that our own results have been most gratifying. We do not claim to have cured a single inoperable cancer of the breast, but do know that some have been restored from a state of misery to a condition of comparative comfort, and that at least two are alive and apparently in good health after a lapse of ten years.

It is interesting in this connection to speculate as to what might be accomplished in a series of more favorable cases by radiotherapy alone. It is reasonable to suppose that its greatest good would be accomplished in the same group of cases (amounting to about 30 per cent) that are most amenable to surgery. It is not probable that a considerable number in this group could be cured? If so, what about the remaining 70 per cent? Would not the average period of longevity and well being be materially in-

creased? These are problems which sooner or later will have to be solved.

A second group of cases generally referred for radio-therapy are the recurrences, or perhaps a better term would be the recrudesences, following operation. Our personal experience in this group has on the whole been discouraging. We do not know that we have ever caused the permanent disappearance of recurrent cancer of the breast. In some cases, we have caused a temporary disappearance, but with possibly one exception our hopes for a permanent cure have been shattered. The one exception to which I refer was an extensive adenopathy of the neck and axilla following a double breast amputation for carcinoma, which has now been apparently well for a period of three years. The result in this case was so exceptional that we are doubtful as to the actual pathology of the adenopathy.

While we are exceedingly skeptical as to the curative value of radiation in these cases, we are convinced that it is useful as a palliative measure. By its judicious use the resort to narcotics can often be entirely obviated.

In general it may be stated as our experience that cancer recurrences and metastases do not respond nearly so well to radiotherapy as do the primary growths. This can in part be explained on the assumption that recurrence is simply an evidence of unusual malignancy, but it is highly probable that the real reason is much more complex. It is known that a biopsy is capable of transforming a relatively innocent lesion into one of extreme malignancy, and it is not improbable that the same cause operates with respect to the resistance of cancer recurrences and metastases, not only to radiotherapy, but to surgical and other treatment as well.

It has been quite a general practice for the past several years to refer all operated cases of breast cancer for post operative radio-therapy, and this constitutes by far the largest group with which we have had to deal. Surgeons generally have been eager to have others share their responsibility and disappointments in a disease where their independent efforts have not been altogether a shining success.

Many surgeons refer all of their breast cases for post-operative treatment regardless of the extent or character of the growth. They do so on the assumption that some cancer elements may have been left in the patient's body. In about three-fourths of the cases this assumption is entirely correct. It may reasonably be assumed that the remaining one-fourth have already been cured when they are sent for treatment, and further treatment by radio-therapy would be entirely superfluous. Our concern,

therefore, is with the 75 per cent who still have cancer. Personally we are of the opinion that this large group of patients are in a worse condition than before operation. To state the case more succinctly, we believe that for every cancer of the breast cured by surgery alone four have been made definitely worse. We are rather strongly convinced that they are worse, not only from the standpoint of the patient's actual condition, but also from the standpoint of any anticipated benefit from radio-therapy. It has already been intimated that it has been our experience that recurrences of breast cancer respond much less favorably to radiotherapy than do primary growths. This is true of cancers in general and is particularly notable in cancers of the uterine cervix. In cases referred for post-operative radiotherapy, while it is true that we are not called upon to treat a recurrence, we are called upon to treat a traumatized cancer, and the analogy is not as far fetched as might appear at first thought.

It is manifestly impossible to prove what, if any, good has been accomplished by post-operative treatment. Certain statistics from foreign sources have tended to show that such treatment has actually increased the incidence of recurrence. We doubt if this is true, but we also doubt exceedingly if we have ever prevented a recurrence of mammary cancer by post-operative radiotherapy. We know this much that we have seen a great many recurrences and metastases occur in spite of vigorous treatment. We have particularly noted that these recurrences are by no means all deep seated, but have repeatedly seen lenticular metastases occur in skin that has been consistently bombarded by the roentgen ray over a prolonged period. This, of course, does not prove anything, but is at least suggestive.

Pre-operative radiotherapy of cancer of the breast has been championed by some radiotherapists, but has not, so far as we know, ever become generally popularized. The surgeon has always looked askance at any procedure that tends to delay operative interference. We do not believe that such an attitude harmonizes with certain known facts concerning the effects of radiotherapy on cancer. Practically every primary cancer will show definite obvious improvement under efficient radiotherapy. This is evidenced by a diminution in the size of the primary tumor, and also a decrease in the size of adjacent lymph nodes when these have become involved. This improvement varies in degree, but in our experience is well nigh universal. It reaches its maximum, as a rule, in from one to three months after beginning treatment, and it is usually within this period that the tide of en-

thusiasm, both of the patient and of the radiotherapist reaches its height. As is well known, a great many basal cell cancers, and some of the more malignant types eventuate in a complete cure, but unfortunately, a great majority of the latter group, after a variable period of betterment, again begin to grow, and when this occurs further treatment seems to be of little avail in arresting the progress of the disease.

We believe, therefore, that the most favorable time for operative interference in cancer of the breast is about six or eight weeks after instituting roentgen treatment. This, of course, presupposes that the treatment is efficiently administered.

We realize that it is little short of sacrilege to propose such a course, but we do so with the conviction that the following advantages will accrue:

(1) In practically all cases the surgeon will actually have less cancer tissue to remove. In many cases this will amount to more than 50 per cent.

(2) The danger of local operative implants will be lessened.

(3) The danger of cancer dissemination incident to the handling of the tumor and traumatization of the tissues will be restricted.

(4) A considerable number of inoperable and border line cases will become definitely operable.

(5) The axillary region can be treated efficiently before operation, whereas this is seldom practical after operation, because of the restricted mobility of the arm.

The principal objection to the method is the fact that it will be found difficult to persuade many patients to submit to operation after experiencing the initial benefits of radiotherapy. This can be obviated in large measure by clearly outlining a tentative course to be persued before beginning treatment.

Another circumstance, although not a valid objection, which will tend to discredit the procedure, is the fact that failures will be attributed to operative delay rather than to the inherent nature of the disease.

The question of radiotherapy in cancer can not be dismissed without brief reference to recent developments in roentgen technique.

It must be admitted that the question of what constitutes efficient treatment in more or less deep seated cancer, is at present in an unsettled state.

For several months we have used the following technique:

Milliamperes, 5; spark gap, 9 to 10 inches; filtration, ½ millimeter copper and 1 millimeter aluminum; skin focus distance, 12 inches; time for each area, 3 hours.

Breast cases have been treated over from two to four areas, de-

pending on circumstances. This makes an exposure time of from six to twelve hours. We believe that one such treatment, followed by operation in from four to eight weeks, if the case is operable, probably affords the best chance of cure. Possibly another such treatment given two or three weeks after operation would be of some value, but we believe that practically all of the benefit to be derived in the cure of cancer by radiotherapy is accomplished by one or two treatments, and that the initial blow should be as hard as possible. Certainly treatments repeated month after month over an indefinite period are potential for considerable harm, and are of very doubtful benefit.

We have observed no skin effects from our present technique other than an intense bronzing.

Roentgen sickness is often distressing. It is hardly practical to give all of the treatment on one day, and when divided over several days it often requires considerable persuasion to induce the patient to complete the series.

We believe that with such dosage there is in some cases a potential danger of a profound or possibly fatal toxemia, but in an otherwise hopeless malady we do not hesitate to assume that risk.

In conclusion it may be stated as our belief that results are superior to those obtained by the older methods and that radicalism in the radiotherapy of cancer is no less essential than it is in its surgical management.

NOTE—Since the above paper was prepared, in the early spring, we have had a few cases, treated in accordance with the technique outlined, in which there has been some vesication of the skin. In every instance this has healed within two or three weeks. The reaction has not been of such a character as to induce us to modify the technique, but we feel that attention should be called to the possibility of such an occurrence.

The advent of hot weather is considered a possible factor in its production.

We believe that the beneficial effects of the amount of radiation received by the patient more than compensates for the temporary discomfort occasioned by the dermatitis.

*—Read at Mid-Summer Meeting of Radiological Society of North America, Boston, June 3rd and 4th, 1921.

EDITORIAL

Journal of Radiology

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Annual Meeting

IT is not a moment too early to begin thinking seriously about the annual meeting, and the plan of society activity for the ensuing year, which must be threshed out at that time.

There is every desire on the part of the outgoing as well as the incoming officers to do all they can toward the fulfillment of those responsibilities which The Radiological Society of North America enjoys.

But the officers must have the assistance of the rank and file of the membership, otherwise the society becomes so autocratic as to fall from sheer single-mindedness.

For these and many other reasons which might be cited in support of the proposition, it is hoped that every member will come to the annual meeting next December with definite ideas concerning the constructive and the creative work to be undertaken by the society during the coming year; and with those ideas boiled down, also, to some practical working plan.

On behalf of those officers charged with the responsibility of working out the program and all necessary arrangements, the thoughtful consideration and coöperation of every member is solicited because in that fact, and in that fact alone, is the source of inspiration like which there is nothing else existent.

Cancer

A RECENT news despatch from Geneva, Switzerland, where The League of Red Cross Societies was then in session, is to the effect that, during the four years, 1908 to 1912, cancer caused more than 1,500,000 deaths in civilized countries. Switzerland headed the list with a ratio of 125 for every 100,000 inhabitants. Holland and England came next; and the United States third, with Italy last. The disturbing fact is that, in the United States, the statistics compiled show cancer to be on the increase.

Probably no other disease offers such disheartening response to any method of treatment yet devised as cancer. X-rays and radium, however, seem at the present time to contain more latent possibilities than any other branch of medicine.

From the curative side, the main difficulty seems to be to obtain sufficiently early recognition of cancerous growths. While on the preventive side, comparatively little is known concerning incipience.

All which suggests that here is a very fertile field for exhaustive research by radiologists especially, because they just now more than all other members of the medical profes-

sion seem to be specifically impounded in the interests of suffering humanity. That is the obligation which rests with this particular specialty.

A Research Program

FOR the purpose of lending proper emphasis to the importance of the work which can without question be done by a properly constituted committee or bureau of research laboring under the auspices of The Radiological Society of North America, and for the purpose, also, of recording and commending the zeal and thoughtfulness with which the British Association of Radiology and Physiotherapy has already undertaken the job of laying out a specific research program in its broad relation to the practice of radiology, and then setting it up in sufficient detail to make certain all the diverse ramifications of that program will be encompassed and considered, the following statement of known factors and the desiderata which it is hoped will be their happy sequelae are taken from the preliminary report of the X-Ray and Radium Protection Committee of the British Association. The purpose of this committee is to discover ways and means for preventing the debilitating and destructive effects from continuous contact with these valuable and indispensable adjuncts to the practice of medicine.

INTRODUCTION

The danger of over-exposure to x-rays and radium can be avoided by the provision of efficient protection and suitable working conditions.

The known effects on the operator to be guarded against are:

1. Visible injuries to the superficial tissues, which may result in permanent damage.

2. Derangements of internal organs and changes in the blood. These are especially important, as their earlier manifestation is often unrecognized.

GENERAL RECOMMENDATIONS

It is the duty of those in charge of x-ray and radium departments to ensure efficient protection and suitable working conditions for the personnel.

The following precautions are recommended:

1. Not more than seven working hours a day.

2. Sundays and two half-days off duty each week to be spent as much as possible out of doors.

3. An annual holiday of one month or two separate fortnights.

Sisters and nurses, employed as whole-time workers in x-ray and radium departments, should not be called upon for any other hospital service.

PROTECTIVE MEASURES

It cannot be insisted upon too strongly that a primary precaution in all x-ray work is to surround the x-ray bulb itself as completely as possible with adequate protective material, except for an aperture as small as possible for the work in hand.

The protective measures recommended are dealt with under the following sections:

I.—X-rays for diagnostic purposes.
II.—X-rays for superficial therapy.
III.—X-rays for deep therapy.
IV.—X-rays for industrial and research purposes.
V.—Electrical precautions in x-ray departments.
VI.—Ventilation of x-ray departments.
VII.—Radium therapy.

It must be clearly understood that the protective measures recommended for these various purposes are not necessarily interchangeable; for instance, to use for deep therapy the measures intended for superficial therapy would probably subject the worker to serious injury.

I.—X-RAYS FOR DIAGNOSTIC PURPOSES

1—Screen Examinations.

(a) The x-ray bulb to be enclosed as completely as possible with protective material equivalent to not less than 2 mm. of lead. The material of the diaphragm to be equivalent to not less than 2 mm. of lead.

(b) The fluorescent screen to be fiitted with lead glass equivalent to not less than 1 mm. of lead, and to be large enough to cover the area irradiated when the diaphragm is opened to its widest. (Practical difficulties militate at present against the recommendation of a greater degree of protection).

(c) A traveling protective screen, of material equivalent to not less than 2 mm. of lead, should be employed between the operator and the x-ray box.

(d) Protective gloves to be of lead rubber (or the like) equivalent to not less than ½ mm. of lead, and to be lined with leather or other suitable material. (As practical difficulties militate at present against the recommendation of a greater degree of protection, all manipulations during screen examination should be reduced to a minimum).

(e) A minimum output of radiation should be used with the bulb as far from the screen as is consistent with the efficiency of the work in hand. Screen work to be as expeditious as possible.

2—Radiographic Examinations ("overhead" equipment)

(a) The x-ray bulb to be enclosed as completely as possible with protective material equivalent to not less than 2 mm. of lead.

(b) The operator to stand behind a protective screen of material equivalent to not less than 2 mm. of lead.

II.—X-RAYS FOR SUPERFICIAL THERAPY

It is difficult to define the line of demarcation between superficial and deep therapy.

For this reason it is recommend that in the reorganization of existing, or the equipment of new, x-ray departments, small cubicles should not be adopted, but that the precautionary measures suggested for deep therapy should be followed.

The definition of superficial therapy is considered to cover sets of apparatus giving a maximum of 100,000 volts (15 cm. spark gap between points; 5 cm. spark gap between spheres of diameter, 5 cm).

CUBICLE SYSTEM

Where the cubicle system is already in existence it is recommended that:

1. The cubicle should be well lighted and ventilated, preferably provided with an exhaust electric fan in an outside wall or ventilation shaft. The controls of the x-ray apparatus to be outside the cubicle.

2. The walls of the cubicle to be of material equivalent to not less than 2 mm. of lead. Windows to be of lead glass of equivalent thickness.

3. The x-ray bulb to be enclosed as completely as possible with protective material equivalent to not less than 2 mm. of lead.

III.—X-RAYS FOR DEEP THERAPY

This section refers to sets of apparatus giving voltages above 100,000.

1. Small cubicles are not recommended.

2. A large, lofty, well ventilated and lighted room to be provided.

3. The x-ray bulb to be enclosed as completely as possible with protective material equivalent to not less than 3 mm. of lead.

4. A separate enclosure to be provided for the operator, situated as far

as possible from the x-ray bulb. All controls to be within this enclosure, the walls and windows of which to be of material equivalent to not less than 3 mm. of lead.

IV.—X-RAYS FOR INDUSTRIAL AND RESEARCH PURPOSES

The preceding recommendations for voltages above and below 100,000 will probably apply to the majority of conditions under which x-rays are used for industrial and research purposes.

V.—ELECTRICAL PRECAUTIONS IN X-RAY DEPARTMENTS

The following recommendations are made:

1. Wooden, cork, or rubber floors should be provided; existing concrete floors should be covered with one of the above materials.

2. Stout metal tubes or rods should wherever possible, be used instead of wires for conductors. Thickly insulated wire is preferable to bare wire. Slack or looped wires are to be avoided.

3. All metal parts of the apparatus and room to be efficiently earthed.

4. All main and supply switches should be very distinctly indicated.

Wherever possible, double-pole switches should be used in pereference to single-pole. Fuses no heavier than necessary for the purpose in hand should be used. Unemployed leads to the high tension generator should not be permitted.

VI.—VENTILATION OF X-RAY DEPARTMENTS

1. It is strongly recommended that the x-ray department should not be below the ground level.

2. The importance of adequate ventilation in both operating and dark rooms is supreme. Artificial ventilation is recommended in most cases. With very high potentials coronal discharges are difficult to avoid, and these produce ozone and nitrous fumes, both of which are prejudicial to the operator. Dark rooms should be capable of being readily opened up to sunshine and fresh air when not in use. The walls and ceilings of dark rooms are best painted some more cheerful hue than black.

VII.—RADIUM THERAPY

The following protective measures are recommended for the handling of quantities of radium up to one gram:

1. In order to avoid injury to the fingers the radium, whether in the form of applicators of radium salt, or in the form of emanation tubes, should always be manipulated with forceps or similar instruments, and it should be carried from place to place in long-handled boxes lined on all sides with 1 cm. of lead.

2. In order to avoid the pentrating rays of radium all manipulations should be carried out as rapidly as possible, and the operator should not remain in the vicinity of radium for longer than is necessary.

The radium when not in use should be stored in an enclosure, the wall thickness of which should be equivalent to not less than 8 cm. of lead.

3. The handling of emanation should, as far as possible, be carried out during its relatively inactive state. In manipulations where emanation is likely to come into direct contact with the fingers, thin rubber gloves should be worn. The escape of emanation should be very carefully guarded against, and the room in which it is prepared should be provided with an exhaust electric fan.

EXISTING FACILITIES FOR INSURING SAFETY FOR OPERATORS

The governing bodies of many institutions where radiological work is carried on may wish to have further guarantees of the general safety of

the conditions under which their personnel work.

1. Although the committee believe that an adequate degree of safety would result if the recommendations now put forward were acted upon, they would point out that this is entirely dependent upon the loyal coöperation of the personnel in following the precautionary measures outlined for their benefit.

2. The committee would also point out that the National Physical Laboratory, Teddington, is prepared to carry out exact measurements upon x-ray protective materials and to arrange for periodic inspection of existing installations on the lines of the present recommendations.

3. Further, in view of the varying susceptibilities of workers to radiation, the committee recommends that wherever possible periodic tests, that is, every three months, be made upon the blood of the personnel, so that any changes which occur may be recognized at an early stage. In the present state of our knowledge it is difficult to decide when small variations from the normal blood-count become significant.

Probably a good deal has already been done by many radiologists to overcome the difficulties pointed out by the British Association Committee, though familiarity so often breeds contempt that a recapitulation of the whole problem with its incident dangers will incline those working with x-rays and radium to more exact care in the protection of their persons.

There is, however, this outstanding fact: it at once becomes apparent, from a reading of the detailed statement made by the British Committee, that a research committee or bureau in permanent form can, by close coöperation with manufacturers of x-ray equipment, accomplish a great deal to protect operators and to standardize equipment so that an operator desiring to instal protective measures will know exactly what he is up against. More than this, the field for sincere collaboration between scientists, physicists and electrical engineers employed by manufacturers and a permanent bureau representing radiologists is so large no time should be dawdled away in argument about whether such a bureau should be created, but rather the question of ways and means should be taken up immediately and seriously.

State Medicine

THE sweeping reorganization which has taken place in business in the past thirty years is carrying over into professional life. That reorganization has developed a social code built upon the impersonal relationships of specilization, standardization, and quantity production. Business has broadened in proportion to international markets, but the medical profession, like most every other profession which is a part of our complex existence, is still trying to stretch an individualistic concept of its obligations and responsibilities to cover the ubiquities of a modern business world.

Most of us hesitate when it comes to organizing such an intimate part of our lives as the old family physician into a scientific machine for quantity production. There linger tender memories of the kindly doctor who was omnipresent if not omnipotent, who brought people into the world in the morning, ministered to all the community ills at midday, and then sat up with Grannie Everybody the night she died—that gentle old soul who never grew too old, whose kindly ministrations were the frankincense and myrrh of a humdrum existence—the one man in the whole circle of our acquaintance who somehow seemed to have contact with the beginning and ending of all things and give us assurance of Divinity.

Of course, to contrast the impersonal relationships of specialized medicine, necessitating the introduction of a score of doctors and an army of laboratory men and specialists into the holy of holies of our private lives, does not make a pretty picture.

When viewed in the abstract men rebel at such a proposal. But the virus of specialization is in the blood. When the man of business suffers the slightest ailment he calls a specialist. So the memory of that type of medical man who was all things to all men is about all there is left. Economic laws and the demands of a modern world have scotched the romance of the general practitioner; the science of medicine is now being called on to safeguard the ability of men and women everywhere to do a day's work.

Quite naturally many of the older members of the profession find it extremely difficult to adjust themselves; they are bewildered at the mass of knowledge and scientific fact presented and demanded at every turn; they are not able to see clear through when they look at younger men, without the long years of gruelling experience, confining their studies to a single item of medical science.

These older members of the profession are not the only persons who wonder how organization can be introduced into the intimate affairs of human life. Most everybody else either refuses to think about the matter at all or is perfectly willing to shift the whole problem to that political worker of magic, the state, which they try to make themselves believe accomplishes utopias by some mysterious legerdemain beyond the ken of man.

But there is nothing in that. There is no mind for the solution of human problems except the human mind.

That is why it is hoped this frank discussion will stimulate professional thought on the subject. That is why, at the risk of seeming presumptuous, we hope to have some part in developing a comprehensive program of preventive medicine which can and will be accomplished by the medical profession.

Professedly such a program must be predicated on the public interest as reflected by the public health. Nothing less than that will answer that profound obligation which is the habiliment of every honest medical man. No other ultimate purpose of the medical profession as a social unit is defensible.

That is why the statement of Dr. J. Whitridge Williams, Dean of Johns Hopkins Medical School, that the time has come when a halt will have to be called on many members of the medical profession who charge all the traffic will bear, may be accepted as evidence of the fact that at bottom the instances of which he complains are but sporadic attempts on the part of medical men to equalize their charges with costs so as to provide a decent return.

No brief is held for the medical mountebank. There can be no question that the medical profession suffers constantly from the operations of self-appointed healers, unconscionable quacks, near-doctors, constitutional manipulators, and a score of other miracle perverts. But in the main these are not recognized as members of the medical profession. They are the jackals which infest every business, every profession. And so long as a lot of people who are sick in the head and not in the feet insist upon spending their money even though they cannot find a reputable physician who will take it, there will always be a clientele willing to take the part of accessory before the fact in the prostitution of the best science yet devised for ministering to the ills which the human family suffers—suf-

fers many, many times needlessly, but nevertheless suffers, and will continue so to do until men and women have learned to correctly value health while they still have it.

Undoubtedly, there are some members of the medical profession who "get the money." It would not be a human profession if it did not here and there develop a scoundrel. But speaking by and large, the ratio of wealth found in the medical fraternity is far smaller than in any commercial line, notwithstanding the fact that even a reasonable degree of medical skill requires years of laborious study, and anything like a decent livable practice calls for unconscionable hours devoted to serving men and women who have gone down from a myriad host of causes all along the highways where men and women congregate, or the secluded byways where the fearless set themselves up in the rugged privacy of Nature's imponderables.

At base, the present failure of the medical profession arises out of the fact that it has not progressed in the science of organization as have most of our economic institutions. It hasn't learned to figure costs or developed those facts which justify the charges it exacts. Yet that is what it must do. It cannot attract the necessary capital to purchase and maintain the expensive laboratories of specialized medicine unless it does that. The first law of economics is that capital is entitled to a reasonable return. The second law is that labor, or professional skill, is also entitled to a reasonable return. And without fear of contradiction, the statement is made that there are many specialists, perfectly honorable, skillful, and above all things else, professionally without reproach, with capital investments in laboratory ranging anywhere from $5,000 to $100,000, who, after charging off a fair return on the investment do not earn as much as an office manager or the superintendent of a contracting outfit.

For evidence of the fact that the medical profession will have very soon to stand scrutiny before a public imbued with the idea of setting up a medical machine after its own pattern with no regard for the sources of human infirmity or the painstaking and sacrificial labor incident to their obliteration, one needs go no further than The Saturday Evening Post of July 16th.

Discussing Dr. William's statement, the editor of The Post goes on to say:

> "It is unfortunately true that occasionally a medical or surgical man in a large city, together with the laboratory men and specialists who assist him in making his diagnoses, charges whatever he dares; but it should be taken into account that the great majority of family physicians regard such men with contempt and do everything in their power to prevent guileless patients who appraise the skill of service solely by its cost, from falling into the clutches of these dollar doctors."

Again:

> "No action charging rapacity can lie against the great mass of family practitioners. As a rule they are overworked and underpaid, and in most cases they would be far richer men if their fees were in closer accord with the services they render."

Again:

> "For many years the overhead costs of medical service have been steadily rising. The patient pays more and gets more. The whole tendency of modern medicine is to lean more and more heavily upon collateral sciences, and to invoke their aid in substituting moral certainties for the exercise of unassisted judgment, which, though frequently highly skilled, was often unsatisfactory. The common use of the x-ray is the best known illustration of this tendency, though dozens of others might be named."

Was there ever a better demonstration of the conflict between the heart and the head which has been pointed out? Could there be a stronger plea for the sovereignty of the old family physician, whose place in the sun of human life is now assailed by the merciless exactions of economic law?

What could be more subtle than the effort to make the transition easy by interpolating these words:

> "Most physicians are quite ready to acknowledge that they charge their rich patients more than their poor ones. It is stated on high medical authority that the wealthiest fifth of the average community indirectly pays most of the doctors' bills of the poorest two-fifths. Persons in the intermediate layer pay just about what they should. Until the practice of medicine is taken over by the state there are only two other methods that can be employed: First, to charge neither rich nor poor more than a nominal fee; and second, to serve only the rich and well-to-do and let the poor shift for themselves. The former course is closed to the doctors by the first law of nature; the second by the dictates of humanity."

Was ever the wish better father of the thought? "Until the practice of medicine is taken over by the state there are only two other methods that can be employed," and neither is practical or possible. Is it possible that the trend toward specialism, whose high purpose is to "substitute moral certainties for the exercise of unassisted judgment," would disappear under state medicine, or that those economic laws which admittedly are forcing the medical practitioner to specialize would become one whit more benign under governmental operation? Would capital invested in plant, laboratory, and library be any the less entitled to earn a reasonable return under state medicine than under private ownership? Would professional skill be less costly or less valuable if compensated by taxation?

Believing that the editor of The Post will, without hesitation, answer all these questions negatively, the sole issue remaining is whether specialism can best be accomplished under some form of state medicine through taxation, or by the medical profession itself. That is something worth thinking about. It involves the reconstruction of every phase of human life. It is an attempt to measure and chart the reactions of the delicate texture of human passions. And at the outset it will be a choice between individual initiative on the part of men whose attainments are in exact proportion to intensity of devotion to the job, and the practice of medicine by rote according to governmental prescription. That may sound like a subtle distinction. But it is just that extreme subtlety of impulse which determines individual response to a wide range of incentives. Whether those incentives can be maintained or whether other incentives can be substituted which will spur men on to more sacrificial service under state medicine—that is one of the very real problems which confronts the man who would make the practice of medicine a paternalistic matter. Perhaps the medical profession as a whole is less responsive to the profit motive, speaking purely of the money side, than is any other class; but the fact remains, as the editor of The Post indicates, the first law of nature is self-preservation; and not many men or women in this sunny land of ours but are susceptible to that law. That sounds a good deal like begging the question at issue. Perhaps in a sense it is; because the public may be perfectly willing to insure the medical profession a comfortable living without regard to labor performed just to satisfy its whim about divesting the

practice of medicine of the profit motive. That was the ultimate objective behind the muckraking in politics so vigorously prosecuted a few years ago. And how well it succeeded every man can judge for himself without assistance from the medical profession.

DEPARTMENT OF TECHNIQUE

Stereoscopic Radiography

THE advent of stereoscopic radiography is one of the most important steps in the development of this specialty in medicine. Much is due to the untiring enthusiasm of Dr. Emil G. Beck for bringing this method of examination to the forefront. Even though it has been in use for so many years we feel that it is not used as generally as it deserves. Its chief value, of course, is in the fact that it gives us the third dimension of depth as well as heighth and width, enabling us to see around the corner, if you will allow this expression.

It is especially applicable to parts of the body when making plates in two planes is either difficult or impossible. But aside from use in this type of cases, it has tremendous advantages, especially in the examination of the wrist and the foot. We do not hesitate to say that many cases of fracture of the carpal-scaphoid have been overlooked because the examining physician used only the flat plate in two planes. We might even go further and say that practically every Colle's fracture which has been well reduced and in which motion has followed early and in which considerable disability still exists, especially in the extension of the hand on the forearm, is complicated by fracture of the carpal-scaphoid. This fact is mentioned merely to emphasize the necessity of following the routine of making stereoscopic plates of the wrist in the dorso-ventral position as well as a flat plate in the lateral position.

Of course, stereoscopic vision is not possible for a person with only one eye. It is also difficult or impossible in persons suffering from near-sightedness.

Stereoscopic examination of the chest has been especially employed by Dr. W. Walter Wasson of Denver, and to him we owe much in refinement of technique in this kind of examination.

Dr. Jas. T. Case has called to our attention the value of stereoscopy in examination of the colon.

Aside from these special fields, we feel that it should be used as a routine in examination of the head, shoulders, hips, sacro-iliac joint, ankle and foot, wrist, foreign bodies and any other region where it will be of value.

A case recently came under our observation which was suffering from both gallstones and renal stones on the same side. Stereoscopic plates enabled us to differentiate between the two. One who has adopted the stereoscopic method of examination will certainly become most enthusiastic about it.

NEW EQUIPMENT

The Victor Sphere Gap

THE Victor Sphere Gap, announced in the August issue of Victor Service Suggestions, presages one of the most stabilizing influences injected into the science of x-rays on the mechanical side for a long time. Indeed, it would seem that in this appliance is to be found the foundation on which to erect a standardized technique in both therapeutic and radiographic work that will bear incalculable benefit for both the medical profession and the lay public.

At no time during the development of the science of x-rays, but more especially since the advent of deep therapy with its requisite high voltage, have radiologists been able to satisfactorily measure peak voltage—an extremity whose inherent possibilities as well as dangers they have had to direct and control at their peril.

But beyond the mere thought of safeguarding against the consequences of over or under-exposure in therapeutic work and the embarrassment of flunking in radiographic work because of uncertain voltage, there has always existed on the part of conscientious radiologists a desire to measure peak voltages accurately that thereby therapeutic and radiographic exposures might be reduced to specific formulae. The importance of this measurement is at once apparent, because in it will be found an exact medium for expressing results obtained or failures encountered.

To overcome this mechanical problem much time and effort has been expended on experimentation with spark gap. Voltages have been measured in inches "back up," with a resulting variation running as high as 30% in the actual dosage delivered to the patient.

From what has been said, it is hardly necessary to add that this method of measurement has proven very unsatisfactory. There were a lot of things whose exact effect could neither be calculated nor prevented in the ordinary laboratory, and many failures registered which can now be obviated by the use of The Victor Sphere Gap. The whimsicalities of polarity, the mechanical idiosyncrasies of appliances and apparatus designed with the utmost care for the conversion of electrical energy into x-rays of the right wave consistency when those appliances were subjected to actual field service, altitude, atmospheric conditions, line fluctuations, and so on, have constantly harassed x-ray operators, and added no small burden to their task of discovering the causes for and computing the effects of the thousand and one human factors met up with in the actual application of x-rays to diagnosis and treatment.

For these, and many other reasons, the radiological profession will welcome the commercial appearance of The Victor Sphere Gap. It will be heralded as the medium of control which will abate many of the fundamental failures in the practical application of x-rays for the purpose of substituting moral certainty for the exercise of unassisted judgment in the practice of medicine.

The Victor Sphere Gap is manufactured according to specifications promulgated by the American Institute of Electrical Engineers after exhaustive research and experiment. Mechani-

cally, it is, of course, very delicate in its functions; it must be machined to the point of absolute perfection, and per se, it must be sturdily constructed to withstand the heat of voltages ranging anywhere from 50,000 to 150,000 under continuous usage.

The advantages of the sphere gap over the point gap are indicated by Mr. Carl Darnell, Commercial Engineer of The Victor Corporation, as:

1. The sphere gap measures peak voltage, while the point gap measures average voltage.

2. The point gap relieves the air pressure between the points by a corona discharge of variable duration and intensity, and then sparks over instead of reaching its real spark over points and then breaking over sharply. The amount of this corona discharge is affected by the shape and size of the points, by the manner in which the points are brought into juxtaposition, and possibly by the physical contour and content as well as proximity of surrounding objects. Even when the most painstaking effort is made to avoid the difficulties just enumerated, the break-down point is so much affected by atmospheric conditions, readings from a point gap are unreliable.

3. There is no corona discharge between the spheres of a sphere gap if the spheres are of proper size. It seems to make little, if any difference, also, from what angle or in what method the spheres approach each other, because at given distances specific voltage pressures will break down air resistance and arc over. Numerous experiments prove that the given voltage for a specific sphere distance will not arc over if that distance be increased even so slightly as a couple of millimeters. In other words, when the voltage pressure is reached which will break down the air gap between spheres, the arc will occur, and not until then. The absence of corona discharge with its attendant destruction of air resistance seems to be the explanation of this apparent mechanical anomaly.

Consequently, it would seem that in The Victor Sphere Gap will be found the means of obliterating the single greatest obstacle which has prevented thus far the standardization of tech-

nique according to specific formulae. By cutting it into the high tension circuit absolute measurement of peak voltages is assured. At this juncture it is perhaps well to say that each sphere gap sold by The Victor Company will be calibrated to meet the altitude and mean atmospheric conditions in which it is to be used before it leaves the factory. This means, that there will be such accuracy of voltage measurement radiologists can exchange results accomplished in such specific terms as to make possible exact duplication of dosage and exposure.

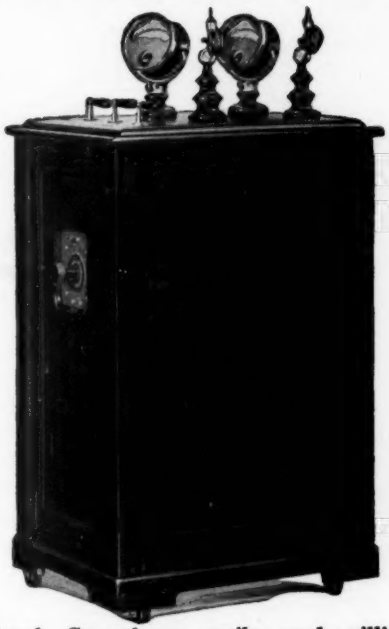
Somewhat apart from the consideration of the appliance proper though so palpably associated with its use as to justify discussion here, is the fact that since specific formulae of dosage and exposure are conceded of primary concern in the standardization of therapeutic and radiographic technique, the suggestion is made that through the employment of The Victor Sphere Gap in a series of experiments leading Radiologists can set up elemental tables of voltage, time of exposure, kind and thickness of filter, port of exposure, number of ports, etc., covering various parts of the human body both for specific disease and for diagnostic and radiographic purposes. Such a compilation issued in permanent form would prove invaluable to technicians and go a long way toward making the results obtained by less experienced operators of more universal value.

These thoughts are inspired by the fact that in the same number of Victor Service Suggestions as contains the announcement of The Victor Sphere Gap appear a number of tables for calculating x-ray absorption. For the Radiologist sufficiently versed in higher physics to be able to work out computations quickly and accurately these tables contain valuable information. But they are so complicated their practical benefit for the average operator is extremely doubtful.

The Fischer Transformer

While not exactly new in the sense that it is unknown to the profession, still the Fischer Universal Interrupterless X-ray Transformer, Type 2-B, embodies some features which distinguish it.

This transformer is of the closed core, oil immersed type. It is equipped with a Spark Meter instead of



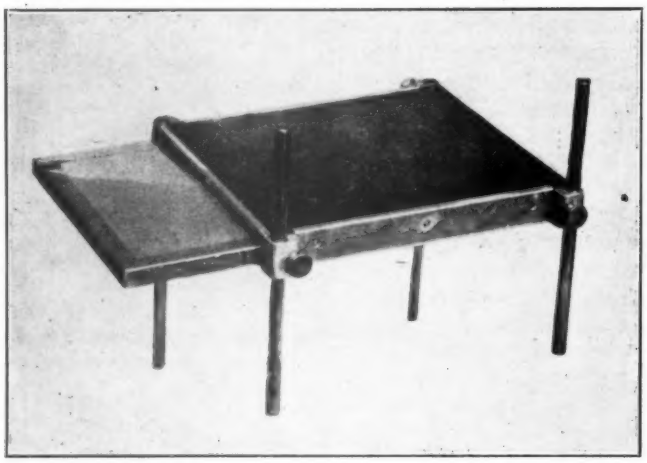
Spark Gap; large easily read milliampere meter; auto-transformer control; exceptionally quiet motor and rectifying wheel; large disc insulating device between the rectifying wheel proper and the motor frame preventing kick-back or break-down, and all switches are concealed. This transformer is guaranteed to deliver 60 M A at a 6-inch gap.

For the person desiring to buy a moderately priced transformer with many of the refinements of some of the more costly ones the Fischer Universal Unit will merit investigation.

Magnuson Plate Tunnel

A particularly serviceable device in the dental as well as the medical x-ray laboratory is the Magnuson Plate Tunnel, lately put on the market by the Magnuson X-ray Company with headquarters at Omaha and with branches at Denver, Des Moines and Kansas City.

The Tunnel in question is constructed with a veneer top with space for a cassette, and is mounted on adjustable legs which can be removed entirely if the operator cares to use the Tunnel for flat body work.



Chief among the advantages which commend this Tunnel to the consideration of the technician and the more critical type of medical radiologist, are:

1. The fact that in sinus work the standard 23 degree angle can be obtained in all cases by merely lowering the Tunnel on the short legs. Beside this the whole Tunnel can be raised or lowered to suit the comfort of every patient.

2. In radiographing the head, knee or foot laterally, especially if the patient be rotund, the adjustable features of the Tunnel enable the operator to accommodate it to the physical facts, assuring correct angle of exposure and proper plate position for good photographic results.

3. The Tunnel can also be used for stereoscopic radiographs.

4. It displaces the inelastic wooden block so familiar to all x-ray laboratories and which so frequently was not of exactly the right height or cut at the particular angle to answer the exigencies of the case in hand.

Without doubt this device should find a place in every laboratory because it has a wide range of utility and because the principle it involves can probably not be incorporated into table construction for anything near the universal service the separate tunnel will render.

ABSTRACTS AND REVIEWS

Syphilis of the Lung. Wile and Marshall. Archives of Dermatology and Syphilology. July, 1921.

FREQUENCY

ACQUIRED pulmonary syphilis is exceedingly rare pathologically, and even more so clinically.

In congenital syphilis it is comparatively frequent in the form of the well-known white pneumonia.

An exhaustive review of the literature shows that pulmonary disease associated with syphilis, and possibly due to syphilis, was reported as early as the sixteenth century.

More accurate reports were made in the latter part of the eighteenth and early part of the nineteenth centuries. The first clear-cut anatomic description of pulmonary syphilis was made by Depaul in 1850. Virchow's description in 1858, under the name of white pneumonia, still stands as a classic monograph on the subject.

Shortly after the appearance of these early papers a large number of cases of pulmonary syphilis were reported, but it seems probable that they were for the most part those in which syphilis was merely coincident with tuberculosis, or that many were actual cases of tuberculosis wrongly diagnosed as syphilis. Carlier in 1882 was able to collect but twenty cases of undoubted lung syphilis studied at necropsy. Hiller could find but eight more cases in the following two years. Pancritius, however, in 1881, thought that it was a common condition and that many people died of it each year. Osler found twelve cases in 2,500 necropsies at Johns Hopkins Hospital. Downing found no cases in 3,000 post mortems at the Massachusetts General Hospital. Massia found only two cases in 6,000 necropsies in Copenhagen. The differences in the percentages of these men may be due to a difference of opinion as to the criteria of syphilitic involvement. Carrera reports changes in the lungs in twelve cases out of 152 necropsies in known syphilitics. Many other writers are mentioned as having found post mortem evidence of pulmonary syphilis.

DIFFICULTY OF RECOGNITION

The clinical picture of pulmonary syphilis is so difficult of recognition that no case can be absolutely accepted without a pathologic examination. It is an accepted fact that syphilis and tuberculosis do frequently occur in the same patient. The presence of either disease in the lung offers an admirable site for the implantation of the other. The pathological results of both diseases—fibrosis and cavitation in the lungs—give local and general symptoms indistinguishable one from the other.

There are, however, cases in which tuberculosis can be eliminated, and which recover completely under antisyphilitic treatment. About fifty such cases have been reported by competent observers, and must be accepted as most probably true pulmonary syphilis.

TYPES OF LUNG SYPHILIS

1. Isolated gumma.
2. Diffuse fibrosis.
3. Diffuse bronchopneumonia.

1. Syphilitic gummata of the lung are exceedingly rare. When found, are more frequently in middle or lower lobe of right lung. Clinical picture depends upon location and stage of process. The symptoms may be nil, or may be those of an advanced ulcerative phthisis, bronchiectasis, or resolving pneumonia.

2. The chronic fibroid changes are the most frequent. These may be due to the breaking down and absorption of small gummata. Thus the findings may depend upon the time the patient is studied, the fibroid condition being a late manifestation, as is the interstitial hepatitis found as a terminal picture in syphilis of the liver.

3. Syphilitic bronchopneumonia is a much disputed topic, and it is not yet agreed whether the symptoms are due to syphilis or to a secondary pneumonic process superimposed on a lung weakened by syphilis.

Chronic interstitial pneumonitis due to syphilis is the most common form of lung syphilis. This is, in fact, the end result of all syphilitic processes

in the lung. It is in this form that symptoms are most frequently encountered. The pathology of the condition is a radiating fibrosis extending out from the hilum through the bronchi, and bands extending from the pleura into the lung substance. Associated with this are isolated fibroid masses throughout the lung substance. The fibrosis causes a lessening of the air capacity of the lung and a narrowing of the bronchi, thus giving rise to symptoms of dyspnea, to coughing and to vascular changes, leading to occasional hemoptysis. Milne reports two patients who showed no lung symptoms during life, but at autopsy extensive syphilitic fibrosis was found in both lower lobes.

PROGNOSIS

If seen early, prompt antisyphilitic treatment offers a fair prognosis. If extensive fibrosis and destruction have taken place, a marked improvement in the patient's general condition may be expected to follow intensive treatment, but little change can be expected in the signs or symptoms of the pulmonary condition.

Three case reports are given. The following is a typical review of an interesting case of chronic interstitial syphilitic pulmonitis.

History—A man, aged 37, entered the university hospital November 5, 1920, having been referred from the department of internal medicine for tabes dorsalis. His complaint was weakness and difficulty in walking. The family history had no bearing on his present illness. There was no family history of tuberculosis or other lung trouble. The patient had had a primary syphilitic sore eighteen years before, which he says was not followed by any secondary manifestations. He had not received any treatment for the condition. He had been married for eight years and had three living children. His wife had had one miscarriage three months ago at the end of the second month of pregnancy. One year previous to admission he had noticed that if he walked in the dark he staggered and had great difficulty in keeping his balance. This condition had been getting gradually worse during the last year. He had had occasional sharp shooting pains in the legs, also dating back one year. Ten days previous to admission he developed a cough and expectoration, some of which had been tinged with blood. There was no history of a definite hemophthisis. The patient had not lost weight noticeably, had not been short of breath, nor had he had night sweats.

Examination—He was poorly nourished and emaciated. He showed many of the classical signs of tabes dorsalis, having Argyll Robertson pupils, marked swaying in the Rhomberg position, absent knee and Achilles reflexes, and a typical ataxic gait. The chest, which particularly interests us, presented considerable retraction of the interspaces. On respiratory excursion there was a slight lagging of the right side. On percussion, there was marked dullness over the right apex and base in the back. The percussion note throughout the remaining part of the lungs was normal. On auscultation, the breath sounds, spoken and whispered voice were exaggerated over the right apex and upper lobe. The breath sounds, spoken and whispered voice, were of normal intensity throughout the remaining part of the lungs. There were a few scattered crackling and bubbling rales at both apexes, which were more marked in the right.

Roentgen Examination—The left lung shows nothing unusual. On the right side the apex is obscured by a rather thick, smoky shadow. From the third to the sixth rib, inclusive, there is a very heavy shadow of thickened pleura in which there are definite localized areas of pronounced fibrosis. From the fifth to the eighth rib, posteriorly, the lung is comparatively free. Below this there is a curious elevation superimposed upon the outline of the diaphragm with a conical shape which probably represents a consolidation. The lateral view shows this mass to lie anteriorly in the pleural angle. Its anterior end is of a high degree of density and cannot be distinguished from the upper surface of the diaphragm. Posteriorly and superiorly, it gradually fades into the surrounding lung substance and there appears to be a space of at least one inch between it and the anterior surface of the nearest vertebra behind. ..A subsequent roentgen report is as follows: The density in the right side of the chest is unusually uniform and free from the irregularities in density and cavity formation and the dense localized sclerosis of tuberculosis. The

interstitial thickening, with a wedge-shaped distribution. There is undoubtedly considerable cicatricial tissue in the pleura, as is shown by its thickening and by the reduction of the width of the interspaces. The pleura is also involved over the extreme apex. The mass in the lower lung is an exceedingly unusual picture in tuberculosis. It has a density almost uniform, not so great as that of the liver and not sharply circumscribed, but with a rather fringed border. There is comparatively little retraction of the mediastinum toward that side. The distinction between tuberculosis and syphilis cannot be sharply drawn on these findings. While the first impression is that of tuberculosis, syphilis might easily produce the same type of lesion and might so modify tuberculosis as to produce the unusual picture of this plate. The total absence of any suggestive sign in the left lung is also puzzling, since it is scarcely conceivable that so extensive a tuberculosis could occur without bilateral involvement.

Treatment and Results—Repeated examinations of this patient's sputum during his stay in the hospital were negative for tubercle bacilli. He received during his stay in the hospital five intravenous and four intraspinal injections. During this time he gained weight and showed continuous improvement. In addition to the increase in weight his cough diminished, and his general health was better than it had been for months past. A letter written to the patient four months after his discharge elicited the response from him that he is able to do light work, that he feels exceptionally well and is in every way improved.

Resume—In a patient with a well developed tabes there occurs the fairly acute onset of pulmonary disease associated with a rather massive infiltrate occupying the lower portion of the left lung. The afebrile nature of the condition, the extensive process and the absence of general reaction, the total absence of tubercle bacilli in repeated examinations of an abundant sputum, and the prompt amelioration under anti-syphilitic treatment, make this case a presumptive one of pulmonary syphilis.

J. J. SNIPES.

Tumors of the Bony Chest Wall. C. A. Hedblom, Rochester, Minnesota. Archives of Surgery, July, 1921, p. 56.

THE first recorded thoracotomy for tumor was reported by Osias in 1778. The literature since then contains comparatively few cases. This review, containing those in the literature and those found at the Mayo Clinic, numbers 213 cases. The pathologic classification shows—

Chondroma	40
Sarcoma	131
Carcinoma	24
Fibroma	5
Exostoses	3
Gumma	1
Uncertain	9
Total	213

Pain is the most characteristic symptom, present in 50 per cent of the cases. Loss of weight and dyspnoea were also noted.

Early diagnosis is more difficult than late. Cold abscess, exostosis, gumma, aneurysm and dermoid cyst must be differentiated.

The treatment is early radical extirpation. Roentgen examination to determine metastases is important. Inflammatory changes found at operation instead of supposed malignancy make the indication for operation more definite. In operating the pleura may be opened and pneumothorax produced. This causes shock in a few cases.

SUMMARY

1. Tumors of the bony chest are relatively common. In 213 cases the ribs were primarily involved in 78.7 per cent, and the sternum in 21.3 per cent.

2. Trauma seems to be etiologic in some cases, both with regard to incidence and to malignant degeneration of the benign forms.

3. Pain is the most characteristic symptom, and may be present in the case of a benign as well as a malignant tumor. Pain may be present before the tumor is recognized.

4. Early differential diagnosis of neoplasm and cold abscess, exostosis, aneurysm and dermoid cyst may be difficult. Pre-operative differentiation of a benign or a malignant neoplasm may be impossible.

5. Early, radical extirpation offers the best prospect of prolonging life and care. Late radical or palliative extirpation, even in the presence of extensive involvement, may result in a relatively long period of freedom from recurrence.

6. Early exploratory thoracotomy is indicated in any doubtful case.

7. Differential pressure anesthesia, while not essential to the successful removal of tumors involving wide opening of the chest, obviates the risk incident to sudden open pneumothorax, and by preventing a closed pneumothorax may lessen materially the occurrence of postoperative shock, pneumonia, and empyema.

8. Intrabronchial or intrapharyngeal insufflation anesthesia affords an effective means of preventing operative pneumothorax.

9. Shock, pneumonia and empyema are the common causes of postoperative deaths.

10. Recurrence has been the rule in most cases of malignant tumor, but there may be freedom from recurrence for many years, and life may be further prolonged by repeated extirpation of the growth.

E. W. ROWE.

Radical Surgery as an Aid to Efficient Radiotherapy in the Apparently Hopeless Cases of Carcinoma. By Emil G. Beck, Chicago. International Clinics, Vol. II, 31st Series, page 46.

SURGERY and radiotherapy, or a combination of both, have outlived all other methods of treating cancer, and stand today as the most efficacious measure for helping cancer. This discussion will be confined to those cases in which surgery is inadvisable or in which recurrence has taken place after one or more operations. Even in apparently hopeless cases something can often be done.

In the study of literature, clinical reports and observation one can clearly see that something can be done by radium and x-ray, applied scientifically. The use of radium is in its infancy, and some workers are more competent in its use than others. Distance and the presence of normal intermediary tissue are barriers to the effective use of radium and x-rays. Also filters screen out the most effective rays. "If skin, muscle and fat, and as much cancer tissue as possible could be removed, so as to leave only remnants of the growth, the radium or x-ray could be applied directly into the cancer bed with no obstruction to the activity of the rays." This is the keynote of the best treatment.

The best known theory of the action on cells by x-ray and radium is that the pathological cells are less resistant than the normal, hence are destroyed first. The author's own theory is that the cancer cells are wild cells, not given the protection of the body's nervous mechanism. The absence of some enzymes or protective substance or arrangement of the chromozone weakens the resistance of the cancer cell.

The author cites a few cases from a series of fifty that he has treated in his method outlined. The first was a sarcoma of the lung. After a two-step operation radium was implanted in the cavity made by an excavation of the tumor mass, which was more or less encapsulated. Four weeks after operation stereoroentgenograms revealed only a small remnant of the tumor mass, and the tumor wall very thin. In all, six applications of radium (2,625 mgr. hours) were applied over a time consisting of about three months. Microscopic section shows a spindle-cell sarcoma. The general improvement has been remarkable. The case will be reported again in one year.

The next case is a malignant ovarian cyst. Exploratory operation confirmed the diagnosis. It continued to grow larger in spite of six months of x-ray treatment. Another operation was performed and as much of the cyst and contents as possible were removed. The interior of the cyst was then treated by direct application of radium at intervals of three weeks, 700 to 1,000 mgr. hours being given each time. The radium treatment was supplemented with deep x-ray therapy, one erythema dose being given every second day. The cavity continued to shrink and closed in sixteen weeks. It is now eighteen months since the operation and the woman is well, doing her own work. "(a) By eversion of the interior of a malignant cyst, we transferred an intra-abdominal into an extra-abdominal tumor, and thus are able to apply x-ray and radium di-

rectly into the seat of malignancy. (b) It is safer to treat the tumor in this manner than to attempt complete enucleation. (c) It is better to treat with radium combined with x-ray than with either alone."

Other interesting cases are cited of treatment given in the same general manner.

Conclusions cannot be drawn from this series alone, and several more years must pass before the ultimate value can be determined. The treatment is radical and the mortality has been heavy. Four cases died of hemorrhage due to ulceration of the arteries. Four died as a result of roentgen ray toxemia. Some of the cases have gone over the one-year test. The results are at least encouraging.

E. W. ROWE.

A Few Notes on the Diagnosis and Differential Diagnosis in Bones and Joints. By G. Forssell. Archives Radiology and Electrotherapy, 1921, XXV, 247.

THE author sets his task to be a resume of the important features in typical roentgenograms of tuberculosis of the bones and joints. In addition he discusses more fully the differential diagnosis and of this and other diseases of the same parts.

Tuberculosis of bone and joints is distinguished by the localization of the bone foci in the epiphyses, by destruction of bone and the absence of bone production, by the punched-out character of the focus, by the atrophy of the surrounding bone, the reduction of the articular cartilages, the erosion of bone and cartilaginous surfaces, condensation and thickening of the articular capsule, and the presence of abscess shadows.

No one sign is pathonomonic, but when all are taken together the picture is very definite and diagnostic.

Koehler's, Perthe's and Schlatter's diseases are differentiated, followed by other conditions such as osteochondritis dessicans, chronic traumatic arthritis, Ricket's and Barlow's disease, and syphilis. The last may be the most difficult to rule out. But usually syphilis of the bone shows bone proliferation or periosteal changes that are sufficient to distinguish it.

The points present are accurate and characteristic. If a mistake occurs it is due to faulty interpretation. Technique that is good, experience and minute study, are the most essential points in making a diagnosis. The picture must be taken as a whole after close study.

E. W. ROWE.

The X-Ray in the Diagnosis of Prostatism. H. M. Johnson. Surgery, Gynecology and Obstetrics, Vol. XXXII., P. 179.

GLANDULAR enlargement of the prostrate causes obstruction in the bladder neck. The difficulties in urination produced are called prostatism. The author finds the routine use of roentgen rays a benefit in the examination. Three plates are exposed. The first roentgenogram shows the presence or absence of calculi. The second shows the bladder filled with air and the outline of the prostate and any other abnormalities in form or size. A third roentgenogram is made after the bladder has been injected with ten per cent sodium iodide or bromide solution. Diverticuli and the bladder outline, as well as ureteral forms, are readily discerned.

This method is to be used in conjunction with other methods commonly employed.

E. W. ROWE.

Treatment of Furunculosis in Infants. Clifford G. Grulee and Cassie Belle Rose, Chicago. Journal Am. Med. Assn., July 2, 1921.

EIGHT cases of furunculosis are reported with the following comments. The lesions vary in intensity. The general impression of the success in this form of treatment is favorable. The number of cases treated is too small to draw definite conclusions. Soft rays and no filters are preferred. When the furuncles are in the early stage and not very deep, the local results have been favorable. They have not done away with surgical procedures in all. Some did not need incision. In cases with extensive furunculosis the results have been most gratifying.

E. W. ROWE.

Melano-Epithelioma. Garden B. New and French K. Hausel, Rochester, Minnesota. Jour. A. M. A., July 2, 1921.

ONLY twenty-four cases of melano-epithelioma primary in the palate are recorded in lierature. One more is added in this report. The nomenclature and literature are briefly stated, and the known theories of etiology discussed.

All the patients complained only of a tumor on the palate. Glands in the neck and obstruction were mentioned only when the cases were advanced. In fourteen cases the cervical glands were involved on the first examination. Duration was one month to four and one-half years. Seven cases were women and eighteen were men. The youngest was 24 and the oldest 80. The average age was 54.

The diagnosis is usually simple. There is a rapidly growing, pigmented, nodular peduncled tumor, usually soft and vascular. The glands in the neck metastasize early. Certain blood dyscrasies and metallic poisons may simulate.

They are the most malignant type of neoplasm. Seventeen of the twenty-five cases were operated upon. The case of this report was cauterized and radium applied. The glands of the neck are not removed by bloc dissection.

Surgery and radium are usually futile, although the exact outcome cannot yet be determined.

E. W. ROWE.

Radium Emanations in the Treatment of Goiter. Wallace I. Terry, San Francisco. Jour. A. M. A., June 25, 1921.

ON August 16, 1920, the first case of exophthalmic goiter was treated in the University of California by emanations. Eight tubes of radium emanations, representing ten millicuries, were inserted into the thyroid gland. Since then he has used six or seven millicuries.

The needles are introduced through a small spinal-puncture needle. Local anaesthesia is used. The emanations are expected to inactivate the thyroid gland.

Of eleven patients, four were considered sufficiently improved, after a lapse of from four to ten weeks for partial lobectomies. One patient died following a partial bilateral lobectomy. The other seven patients show improvement and are still under observation.

This is a preliminary report.

E. W. ROWE.

Radium Treatment for Cancer of the Esophagus. A. E. Rockey, Portland, Oregon. Jour. A. M. A., July 2, 1921.

WHILE advancement in surgery of the gastro-intestinal tract for cancer has been gratifying in the esophagus, it has made but little progress. It is thought to be more prevalent than recorded. In 1917 five persons were left with gastrotomy tubes in place for feeding to prevent early death from cancer of the esophagus. After returning from the service all were dead. There are now three cases under consideration. These are being treated by radium. One appears to be successfully treated.

Timely diagnosis permits the exact location of the radium in the lumen of the esophagus at the point of the cancer. The Sippy method is employed where the lumen has almost closed. In this method a string is swallowed. Over the string a piano wire is introduced. Over this is passed another piano wire to which is attached a rubber catheter containing the radium. The radium is thus located in the affected lumen. The exact technique is carefully described. Confirmation of position may be made by roentgen examination. Coöperation between the surgeon and roentgenologist is necessary.

E. W. ROWE.

A Treatment of Gastric Ulcer Based Upon Modern Clinical, Histopathological and Physiological Investigations. Frank Smithies, Chicago. International Jour. of Gastro-Enterology.

TREATMENT of peptic ulcer has been largely based on empiricism. It should be based more on the fundamental principle.

The problem: From the clinical viewpoint there are many well known

characteristics. It may occur without manifestation. Eighty-four per cent of the cases show periodicity, recovery and relapse. Little prophecy can be made of the future. Cessation of distress does not mean a cure.

The pathology: Even extreme chronic changes cannot always be foretold. Stenoses, hemorrhage, malignancy and involvement of extragastric organs may follow with slight warning. It rarely occurs in persons not already suffering from other abnormalities, infections about the head or inflammation of appendix, gall bladder and pelvic structures.

Summary of Etiological Factors

	No. Cases	Per Cent
1. Infections (chronic and acute)	173	33.1
2. Arteriosclerosis (with 56 cases; without, 21)	77	14.7
3. Visceral hypertonia	68	13.0
4. Chronic anemia	61	11.3
5. Syphilis	41	7.8
6. Visceral hypotonia	27	5.2
7. Postoperative	27	5.2
8. Industrial intoxication	22	4.2
9. Metabolic dysfunction (throid, etc.)	18	3.4
10. Trauma	8	1.5

A single cause for ulcer is obviously impossible to find. There is no basis that ulcer is a distinct disease entity. It may be considered a local accident in a systemic upset. The course depends on the underlying systemic causes.

Ulcers occur in that portion of the stomach of greatest circulatory, muscular and nervous activity. Four-fifths occur in the pylorus, along the lesser curvature and in the antrum, away from the acid-bearing portion.

Physiological changes are not as extreme as many suppose. In 40 per cent of 500 cases the free hydrochloric concentration did not run above 25 per cent. In 35 per cent it was in the normal range. In the remaining 40 per cent it was reduced or absent. The primary damage cannot be done by concentrated acid in the gastric juices. This must influence profoundly the chemical foundation of the treatment. It has been thought that there is a hypersecretion of acid, and this must be neutralized by alkales. Again, pain is not present at the height of gastric acidity. More acid does not increase it. It is relieved as much by lavage and other means as by alkalies.

Recent studies by Cannon, his pupils and others have shown the importance of the motor function of the stomach. Upon this factor rests the rational treatment.

Gastric secretion and gastric emptying are greatly influenced by the kind of food injected. Water and normal salt diminish motor activity and acid secretion. Carbohydrates leave the stomach quickly because they do not unite with the acids, hence the acid control of the pylorus is accentuated. Alkaline solutions retard the emptying. Proteids leave the stomach slowly because they combine with the acids. These facts are given in detail. They are well known and well established and furnish the basis for treatment.

Before starting treatment the etiological factors must be sought for and remedied. Focal infections must be most thoroughly searched out.

Ulcers with much scarring and deformity are surgical unless luetic. Frequent hemorrhage, prolonged pain, perforation, or the danger of malignancy require surgery.

The roentgen demonstration of caloused ulcer exceeding 2 c. m. diameter, when associated with a history of frequently recurring ulcer symptoms and positive tests for blood constantly determined in stools, forms a clinical hint that malignancy can be expected. Callous, recurring ulcers in the pylorus should be operated. Excision if possible, infolding or cautery puncture, without gastrojejunostomy, yields the most satisfactory results. In non-obstructing ulcers gastrojejunostomy should always be accompanied by permanent pyloric closure. Gastroenterostomy properly performed acts by aiding gastric emptying by diminution of free hydrochloric acid, and by permitting limited jejunal regurgitation into the stomach.

Successful medical treatment requires the proper selection of cases by the elimination of those just mentioned.

Outline of Author's Method of Non-Surgical Treatment.

1. Rest in bed.
2. Physiologic rest to the stomach itself.
3. Local applications to the abdomen.

4. Keeping the stomach empty of food.

5. Rectal feeding.

6. When mouth feeding is begun, small quantities of food in liquid form every hour, and a corbohydrate diet, is the plan. Milk is not used. It clots and causes gastric irritation.

7. Limitation of over-production of gastric acid. Alkalies are not used. Alkalinization is harmful. Lavage increases the motor activity.

8. Medical treatment: Medicines are administered to counteract discomfort due to (a) painful gastrospasms, (b) accumulations of over-acid gastric contents associated with peristaltit unrest, (c) pain associated with perforation or ulcer progression. The remedies thus indicated are paraffin, chewing wax, astropin, belladonna or bromides, and at times orthoform. For over-acid secretions, milk of magnesia or calcined magnesia. Gastric lavage is very rarely performed with Carlsbad salts.

9. Hemorrhage: Rest in bed; no food; transfusion; horse serum, coagulose. Surgical intervention very early.

10. Bowels: Soapsuds enema. Later Carlsbad salts; phosphate of soda; liquid paraffin.

11. Lues: Specific therapy. Focal infections; autogenous vaccine.

12. Anemic patients: Iron and arsenic in full doses.

E. W. ROWE.

Correlation of Results of Treatment of Goitre by Surgical and X-Ray Methods. Geo. H. Bingham and G. E. Richards. Toronto General Hospital. Can. Med. Ass'n. Jour. P. 988. Nov., 1920.

THREE hundred cases of goitre, reported as treated by x-rays, gave results of such value that the surgeon should look upon x-ray treatment in the same light as a two-stage operation.

For purposes of classification goitre are divided into:

1. Simple Colloid Goitre. Ninety per cent of the cases in this class were cured.

2. Adenomatous Goitre, including all cystic types not complicated by toxic symptoms. Purely adenomatous and purely cystic goitre do not respond well to x-ray treatment, and their treatment should be entirely surgical.

3. Toxic Goitre. This includes the hyperplastic types and the degenerating adenomata. It is in the exacerbation stage of acute toxic thyroid, when toxicity must be arrested, before operation can be done, that x-ray has had brilliant results. It should always be used before surgery. In many cases subsequent surgery will not be necessary, or if deemed advisable, in many cases for cosmetic results only.

Of the toxic type 50 per cent were cured by x-ray alone; about 30 per cent were improved, but the improvement stopped short of complete cure; 5 per cent showed no improvement. Of the cases showing improvement only, the alleviation of symptoms about equalled that following ligation of the superior thyroid arteries. The sequence of relief of symptoms proceeded about as follows: Nervousness and irritability, tremor, tachycardia, weight, goitre, exophthalmos.

L. J. CARTER.

The Diagnostic Value of the X-Ray Examination in Pulmonary Tuberculosis. W. A. Wilkins. The Montreal General Hospital. Canadian Medical Association Journal, P. 999. Nov., 1920.

COLLABORATION with the clinician is emphasized, although the diagnosis of pulmonary tuberculosis from the plate alone is generally possible. In many cases the stereoscopic plates or films well give evidence of pulmonary changes before physical signs can be detected.

The presence of pulmonary tuberculosis will be evidenced by shadow changes on the x-ray plate. The earliest sign is the appearance in the periphery of a faint cloudy fan-shaped shadow with apex toward the hilus, the ribs of the fan being formed by the thickened bronchial and lmyphatic shadows. Later these bronchial ramifications become beaded and accentuated. Further advance shows fine mottling in the shadow areas. Later this mottling becomes coarser and extends to new areas. The hilus shadows enlarge early, soon lose their identity, and become merged into the general mottling. Breaking down in the mottled areas results in cavity formation.

Healing may take place without any permanent record of the invasion. But generally the shadows do not entirely disappear. Usually there are left small, dense, more or less circular shadows with clearly defined margins, shown chiefly at the apex or middle third or hilus. There may be heavy linear shadows corresponding to the region of interlobar fissures. Healed lesions give clear cut shadows, in contrast with the blurred shadows produced by active lesions.

L. J. CARTER.

In What Cases Do Uterine Fibroids Still Require Operative Removal? Fred J. Taussig, M. D., St. Louis. Jr. A. M. A., Vol. 77, No. 5.

ONE hundred and twenty-three patients with uterine fibroids were treated, of which eighty-seven were operated and thirty-six were treated by radium. The radium dosage ranged from 800 to 1,750 mg. hours, with an average of 1,250 mg. hours. Usually 75 mg. were applied within the uterus in silver and brass for about sixteen hours.

Contraindications to radiotherapy were, first, fibroids over 12 cm. in diameter; second, submucous fibroids protruding through the cervix, pedunculated and intra-ligamentos fibroids; third, rapidly growing calcified or necrotic fibroids, and those complicated with malignancy; fourth, pyosalpinx and ovarin cysts.

The author lays stress on careful diagnosis before radiotherapy is given. He prefers radium to the x-ray although admitting no personal experience with the latter.

Fibroids are nine times as frequent in the colored race as in the white, which he attributes in part to the greater frequency of gonorrheal infection and also to their earlier appearance and more rapid growth.

The cases suitable for radiotherapy have an age incidence of forty-two and one-half years. He quotes the literature to show a percentage of 95.5% cures in 1,099 cases of fibroids.

V. M. MOORE, M. D.

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